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food technology abstracts



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FOOD TECHNOLOGY ABSTRACTS

Vol.25 No. 2
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ABBREVIATIONS

A	ampere	ft	foot, feet	PVDC	polyvinylidene chloride
AAS	atomic absorption spectro- metry	g	gram	qt	quart
abstr.	abstract	GC	gas chromatography	R	rontgen
ad lib.	ad libitum	gn	gravity	rad	rad or radian
ADP	adenosine diphosphate	gal	gallon	ref.	reference(s)
Anon.	Anonymous	gf	gram-force	rev/min	revolutions per minute
AOAC	Association of Official Analy- tical Chemists	GLC	gas-liquid chromatography	RH	relative humidity
approx.	approximately	h	hour	RNA	ribonucleic acid(s)
atm	atmosphere	ha	hectare	S.	South, Southern, etc.
ATP	adenosine triphosphate	HDPE	high density polyethylene	s.d.	standard deviation
a _w	water activity	hl	hectolitre [100 l]	SDS	sodium dedecyl- sulphate
BHA	butylated hydroxyanisole	hp	horse power	s.e.	standard error
BHT	butylated hydroxytoluene	HPLC	high performance/ pressure liquid chromatography	s	second [time]
BOD	biological oxygen demand	HTST	high temperature short time	SNF	solids-not-fat
b.p.	boiling point	Hz	hertz [frequency cycles/s]	sp., spp.	species
Btu	British thermal unit	in	inch	sp.gr.	specific gravity
c-	centi- [as in cm, cm ² , cm ³]	IR	infrared	summ.	summary
cal	calorie	IU	international unit	Suppl.	Supplement
cd	candela	J	joule	t	metric tonne
Cl	curie	k-	kilo- [as in kcal, kg]	temp.	temperature
CMC	carboxymethyl cellulose	K	Kelvin	TLC	thin layer chromatography
COD	chemical oxygen demand	l	litre	TS	total solids
coeff.	coefficient	lb	pound	UHT	ultra-high temperature
conc.	concentrated	lb _f	pound-force	UV	ultraviolet
concn.	concentration	LDPE	low density polyethylene	V	volt
cv.	cultivar	m-	milli- [as in mg, ml, mm]	var.	variety
cwt	hundredweight	m-equiv	milli-equivalent	vol.	volume
d-	deci-	m	molar	v/v	volume/volume
DE	dextrose equivalent	M-	mega- [as in Mrad]	w	watt
detn.	determination	max.	maximum	W.	West, Western, etc.
DFD	dark firm dry	min	minute [time]	WHO	World Health Organization
diam.	diameter	min.	minimum	w/v	weight/volume
dil.	dilute	mol	mole	wk	week
DM	dry matter, Deutsche Mark	mol.wt.	molecular weight	wt.	weight
DNA	deoxyribonucleic acid(s)	m.p.	melting point	yd	yard
dyn	dyne	MPN	most probable number	yr	year
E.	East, Eastern, etc.	MS	mass-spectrometry	μ	micro-[as in g, m]
ECD.	electron capture detection	n-	nano-[10 ⁻⁹ , as in nm]	%	per centum
EDTA	ethylenediaminetetra- acetic acid	N	Newton [kg m/s ²]	>	greater than
Eh	oxidation-reduction potential	N.	North, Northern, normal concentra- tion	≥	greater than or equal to; not less than
ELISA	enzyme-linked immunosorbent assay	NMR	nuclear magnetic resonance	<	less than
f-	femto- [10 ⁻¹⁵ , as in fCi]	NPU	net protein utilization	≤	less than or equal to; not greater than
°F	degree Fahrenheit	oz	ounce	Chemical symbols are used for all elements.	
FAO	Food and Agricultural Organization	p-	pico- [10 ⁻¹² , as in pCi]	ABBREVIATIONS FOR LANGUAGES	
FDA	Food and Drug Administration	p	poise	Language of text	
FID	flame ionization detection	Pa	probability	Dutch	Nl
fl oz	fluid ounce	PAGE	Pascal [N/m ²]	French	Fr
f.p.	freezing point	PER	polyacrylamide gel electrophoresis- protein efficiency ratio	German	De
		p.p.b.	parts per billion	Italian	It
		p.p.m.	parts per million	Japanese	Ja
		PSE	pale soft exudative polytetra- fluorethylene	Norwegian	No
		PTFE		Spanish	Es
		PVC	polyvinyl chloride	Swedish	Sv

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GENERAL

- 234 Bord (RJ) and O'Connor (RE). Who wants irradiated food? Untangling complex public opinion. Food Technology 43(10); 1989; 87-90

The research reported here demonstrates that the extent and degree of public acceptability of irradiated foods depends to a significant extent on what questions are asked and how the answers to those questions are interpreted. Covers background to public acceptability, problems in measuring public acceptance, research methods, analysis of results and pattern of results. 15 references. SRA

- 235 Chaudhuri (S). The market for processed foods in India. Indian Food Industry 8(3); 1989; 10-12

- 236 De Clemente (IM), Vallettrisco (M) and Niola (I). Characterization and suitability in the use of a new frying product. Industrie Alimentari 28(270); 1989; 372-374 (It).

The authors, who have already studied the problem of the stability of edible oils in thermal treatment, characterise a product recommended specifically for frying purposes. They compare the chromatographic properties and the state of oxidation by means of the Oxifrit-Test. AS

- 237 Holmes (A). Technology in the year 2000. Food Manufacture 64(1); 1989; 25-28

Changes expected over the next 12 yrs in Food Technology is outlined with factors like consumer demands, forecasting the future, meeting the challenge, meeting the companies needs and technical resources. SRA

- 238 Ibiyemi (SA), Ehusani (RO), Amaorgu (FB) and Atteh (JA). Studies of the thermal effect on Parkia seeds. Food Chemistry 33(3); 1989; 165-171

Fruits from Parkia filicoideae Welch plant provided the raw seeds was investigated. Portions of the seeds were processed by boiling in water; others were roasted in an oven at 100, 120, and 150 C to obtain beans that were further processed to obtain their oils and seed cakes. The physico-chemical analytical data obtained for the various oils and seed cakes suggest that processing of the seed at 120 C is most suitable to obtain parkia beans of the highest quality. Results obtained from both in vivo and in vitro digestibility studies confirm that seeds processed at 120 C dry-heat produced the best quality beans. AS

- 239 Peri (C). Permanent education and training programs for the technical staff of food industries. *Industrie Alimentari* 27(262); 1988; 1065-1068 (It).

Permanent educational programs are essential to keep abreast of technological progress in food industry. Moreover, improvement of staff's knowledge and culture greatly contributes to people motivation, performance, and satisfaction. The paper illustrates some principles which should be taken into consideration when organizing training courses for the technical staff of a food factory. General topics are also suggested as possible guiding thread and leit-motiv of training programs as for example safety or sensory quality of food. The author wishes that Italian food industries more frequently and systematically resort to such programs especially when they dynamic industry-relationship, as it is in the case of the Biagini Food Safety Division, programs. AS

- 240 Schutz (HG), Bruhn (CM) and Diaz-Knauf (KV). Consumer attitude toward irradiated foods. Effects of labelling and benefits information. *Food Technology* 43(10); 1989; 80-86

The purpose of this research is to investigate the effect of label statements and other information regarding the benefits of irradiations on consumer attitudes. Using a national sample, evaluated irradiation awareness and concern, the influence of FDA approval, the influence of label statements on judgements of quality, freshness perception, price expectation, safety, willingness to purchase and the interest in purchase of specific irradiated foods when benefits are given. SRA

FOOD PROCESSING

- 241 Kroll (J). The application of ultrafiltration in production and processing of food raw material and additives. *Ernährungsforschung* 34(3); 1989; 83-86 (De).

During the last few yrs methods used to separate mixtures of mol. substances by semipermeable membranes have steadily gained technical and economic importance. In particular, ultrafiltration (UF) has been introduced in the food industry. The results of the investigations presented include the use of UF for concn. purification and detoxification of solutions of plant and animal proteins (rapeseed, blood plasma of slaughtered cattle) as well as important functional properties of the protein fractions obtained. AS

- 242 Zadow (JG). Supercritical fluid extraction new technology for the food industry. *CSIRO Food Research Quarterly* 48(2); 1988; 25-32

The author reviews the application of supercritical fluid extraction to a range of foodstuffs, with reference to deodourization and fractionation specific to food processing applications as coffee decaffeination, hop extraction, essence removal and oil fractionation.

Impediments to commercialisation and process potential are also considered. 15 references. SRA

Extrusion

- 243 Fitchali (J) and van de Voort (FR). Fundamental and practical aspects of twin screw extrusion. Cereal Foods World 34(11); 1989; 921-929

This feature article discusses both basic fundamental as well as practical aspects of extrusion. The article provides brief information on extruder types and operational characteristics, residence time distribution, process variables and process control and modeling and optimization. PHR

- 244 Hauck (BW) and Huber (GR). Single screw vs twin screw extrusion. Cereal Foods World 34(11); 1989; 930, 932-934, 936-993

This article provides information on advantages of extrusion process description, and comparative advantages and disadvantages of single and twin screw extruder. PHR

- 245 Padmanabhan (M) and Bhattacharya (M). Extrudate expansion during extrusion cooking of foods. Cereal Foods World 34(11); 1989; 945-949

This feature article discusses the factors influencing the extrudate expansion of food. The article develops a physical picture of the interplay of the elastic and moisture effects on extrudates expansion. The article also covers a mathematical model for the extrudate expansion. PHR

FOOD PACKAGING

- 246 Saguy (I) and Kiploks (EM). Revolution counter for food containers in an agitating retort. Food Technology 43(11); 1989; 68-70

The purpose of this work is to design a device which would allow the measurement of can revolution within the steritort. The result of this research can be utilised to demonstrate the effect of different can/lid material, finish, and configuration on the axial can rotation and process safety. SRA

Packaging materials

- 247 Holland (R) and Santangelo (R). The 'Laminate Film' method for measuring odour transmission rate through food packaging films. CSIRO Food Research Quarterly 48(2); 1988; 40-46

FOOD ENGINEERING AND EQUIPMENT

- 248 Miyawaki (O), Abe (T) and Yano (T). A numerical model to describe freezing of foods when supercooling occurs. *Journal of Food Engineering* 9(2); 1989; 143-151

A universal numerical model for freezing of food materials is proposed. This model is applicable to semi-infinite and finite cases, covering the effects of supercooling and the temp.-dependence of the fraction of frozen water present. To describe supercooling, a three-step freezing model is proposed. Theoretical predictions agree well with experimental results for samples of various shapes and comp. Duration of supercooling, the only variable which should be determined experimentally, was related statistically to coolant temp. AS

Drying

- 249 La Rocca (V), Panno (G) and Pignato (L). Some applications of the vapour compression heat pumps in the food products drying. *Industrie Alimentari* 28(270); 1989; 385-388, 391 (It)

A comparison of the classical drying process and the drying process by heat pump exploitation is reported. Results indicate that in many cases the exploitation of heat pumps offers practical and economic advantages. BV

Equipments

- 250 Fell (J). Problems with powder. *Food Manufacture* 64(1); 1989; 39, 41

Equipments used for handling, weighing and mixing powdered and granular products are reviewed. SRA

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

- 251 Cilliers (JJL) and Singleton (VL). Non-enzymic autoxidative phenolic browning reactions in a caffeic acid model system. *Journal of Agricultural and Food Chemistry* 37(4); 1989; 890-896

Non-enzymic oxidation of caffeic acid was studied at pH 4.0-8.0, at various concn. (1-10 mM) and at temp. 5, 20, and 35 °C. The products of caffeic acid oxidation were investigated by high-performance

liquid chromatography (HPLC) with diode array detection. The proportion of different oxidation products formed from the caffeic acid was affected by the conditions, but the major products are formed in each case and give a constant chromatographic profile under a given set of conditions. Later products appeared to derive by further reactions. The rate of the reaction is increased by increasing pH ($164 \times 10^{-5} \text{ h}^{-1}$ at pH 4.0 and $6020 \times 10^{-5} \text{ h}^{-1}$ at pH 8.0; both at 35°C) and temp. (pH 8.0: 5°C , $764 \times 10^{-5} \text{ h}^{-1}$; 35°C , $6020 \times 10^{-5} \text{ h}^{-1}$. pH 5.0: 5°C , $50 \times 10^{-5} \text{ h}^{-1}$; 35°C , $825 \times 10^{-5} \text{ h}^{-1}$). The Arrhenius activation energy is $49.0 \pm 6.5 \text{ kJ mol}^{-1}$ at pH 8.0 for caffeic acid oxidation. The intensity of brown produced at 35°C in 168 h was highest at pH 6, followed by pH 7 and then pH 8. Brown (420-nm) generation correlated well (P less than or equal to 0.001) with caffeic acid consumption at all pH's and temp. Some of the oxidation products were formed at equal max concn. independent of the pH but at rates that were highest at high pH. Others were dependent on pH, and the highest concn. and rates were found at high pH. The controlling factor in the rate of autoxidation is indicated to be phenolate anion concn. AS

- 252 Jolly (DA), Schutz (HG), Diaz-knanf (KV) and Johal (J). Organic foods. Consumers attitudes and use. Food Technology 43(11); 1989; 60, 62, 64, 66
- 253 Pokorny (J), Pilkova (L), Davidek (J) and Valentova (H). Effect of Amadori rearrangement products on the non-enzymic browning in model systems. Nahrung 32(8); 1988; 767-776

The AMADORI products was prepared from D-glucose and L-alanine after HASHIBA. The browning process was investigated by determining the absorbance at 520nm, in aqueous solutions at 110°C for 5-8 h. Because of the limited access of oxygen and its low solubility in the reaction medium, the browning proceeded after zeroth order kinetics with the max. browning rate at pH = 8-9. The browning rate remained unaffected by addition of sodium sulphite, rutin, propyl gallate (except when present at high levels), iron (III) chloride or copper (II) chloride but decreased in presence of L-cysteine or iron (II) chloride. Hydrogen peroxide bleached the pigment but did not inhibit the subsequent browning of reaction products. Under experimental conditions the solution of AMADORI product did not darken with substantially greater rate than the solution of D-glucose and L-alanine. Lower additions of D-glucose to the solution of AMADORI product moderately increased the reaction rate while additions of L-alanine or L-hydroxyproline moderately decreased the browning rate. AS

- 254 Sundar Rao (K), Jones (GP), Rivett (DE) and Tucker (DJ). Fatty acid and amino acid compositions of Brachycthon discolor, Brachycthon diversifolius, and Brachycthon acerifolius seeds. Journal of Agricultural and Food Chemistry 37(4); 1989; 916-917

For the first time the fatty acid and amino acid comp. of *B. diversifolius*, *B. discolor* and *B. acerifolius* seeds have been reported in this paper. The seeds were indigenous food eaten by Australian

aborgines. The chemical comp. revealed 29.3, 32.1 and 30.5% resp. in *B. discolor*, *B. diversifolius* and *B. acerifloius* seeds. Linoleic and oleic acids were the predominant fatty acids in the triacylglycerols and cyclopropene fatty acids malvalic acid and sterolic acids were present in small concn. (4.6-5.6%, 0.7-1.1%) whereas the protein contents were 26.9, 38.1 and 35.0% resp. The proteins contained most of the essential amino acids except sulphur containing amino acids. NGKR

- 255 Wedzicha (BL), Goddard (S) and Garner (DN). Enzymic browning of sulphocatechol. International Journal of Food Science and Technology 22(6); 1987; 653-657

When sulphur dioxide inhibits the enzymic browning of catechol catalysed by mushroom tyrosinase, the main reaction product is 4-sulphocatechol. When assessed for its browning potential, this product appears to be unreactive and does not inhibit the enzyme. AS

- 256 Wedzicha (BL) and Kaputo (MR). Reaction of melanoidins with sulphur dioxide. Stoichiometry of the reaction. International Journal of Food Science and Technology 22(6); 1987; 643-651

Sulphur dioxide, in the form of sulphur (IV) oxoanions (S(IV)), e.g. HSO_3^- , sulphur dioxide, reacts irreversibly with non-enzymic browning model melanoidins ($M_n > 12000$, prepared by combination of 1.25 mol glucose with 1 mol. glycine ((pH 5.5, 90 °C, 22 h)). When the reaction with S(IV) is carried out for > 39 days at 40 °C and pH 5.5 with initial concn. of melanoidin of 5.71 g/l and S(IV) of 0.0371 M (equivalent to 0.2400 p.p.m. sulphur dioxide), up to one sulphur atom is incorporated for every two mol. of glucose used to form the polymer. This stoichiometry is discussed in relation to the degree of unsaturation of the melanoidin. AS

Chemistry (Analytical)

- 257 Brunn (H), Georgii (S), Stojanowic (V), Flemmig (R) and Thalacker (R). Xenobiotics in foodstuffs-estimation of a daily food intake. I. Determination of polychlorinated biphenyls in selected foodstuffs. Deutsche Lebensmittel-Rundschau 85(8); 1989; 239-246

The concn. of six selected single PCB congeners, for which legal tolerance levels became valid in 1988 and of the congener No. 49 (2,2', 4,5'-tetrachlorobiphenyl) were determined in foodstuffs of animal origin, in margarine and beer, which are important for the alimentary acceptance of polychlorinated biphenyls. The investigations show that the tolerance levels were only reached up to a max. of 20% with exception of sheep cheese (imports) and mutton (inland). The major polychlorinated biphenyls found in the samples were the high chlorinated PCB congeners Nos. 101, 138, 153 and 180. Low chlorinated biphenyls as 2,2', 4,5' - and 2,2', 5,5'-tetrachlorobiphenyl (PCB Nos. 49 and 52) were also found in many of the analyzed samples in the lower concn., though it must be mentioned that PCB No. 49 (2,2,4,5'-tetrachlorobiphenyl) was the main contributor. If only the easily metabolized congeners No. 28 (2,4,4'-trichlorobiphenyl) and No. 52 are determined, then a non-existence of low chlorinated biphenyls in food-

stuffs would falsely stated. For all PCB congeners we investigated in the foodstuffs of animal origin, margarine and beer, we estimated an average daily intake with help of model calculations. The average daily intake of 3.4 µg PCB (sum of the determined congeners) per day and person, or 0.05 µg per kg body wt., so the model calculations showed the following results. The main sources of the PCB intake were the fatty foodstuffs sausage, butter, margarine and fishes followed by milk, eggs and cheese. Meat, poultry and venison contributed only little, beer nothing to the average daily intake of polychlorinated biphenyls. AS

- 258 Denis Page (B) and Avon (RJ). Determination of methyl bromide in foods by head space capillary gas chromatography with electron capture detection. *Journal of the Association of Official Analytical Chemists* 72(5); 1989; 815-822

- 259 Mitchell (GE). Review of methods for the detection of irradiated foods. *Food Technology in New Zealand* 23(5); 1988; 28-30

This paper reviews some of the potential methods for identification of irradiated foodstuffs. Aspects covered include requirements for a detection method, changes produced in food by irradiation, electrophoretic patterns and gel chromatography of proteins, measurement of free radicals, spectrophotometry, chemiluminescence and thermoluminescence, measurement of conductivity, formation of specific chemicals, formation of radiolytic hydrocarbons, formation of deoxy-compounds, measurement of carbonyl compounds, effect on enzymic activity and microbiology. 18 references. SRA

- 260 Schatzki (TF) and Wong (RY). Detection of submilligram inclusions of heavy metals in processed foods. *Food Technology* 43(11); 1989; 72-76

This article describes the use of photographic X-ray radiography and scanning electron microscopy (SEM) to identify particular contaminants in frozen TV dinners, illustrating a method for screening processed foods. Covers X-ray radiography, microscopy and elemental analysis, chemical structure, evolution of results. 19 references. SRA

- 261 Ulbricht (G). Model ideas for utility value determination of foods. *Ernährungsforschung* 34(3); 1989; 81-83 (De).

An approach to the utility value detn. of foods is presented which gives the model for quantitative registration and observation of the development of utility value within the nutrio-economic reproduction process. Five components of the utility value (nutritional value, sensory value, freshness, time economy in food preparation popularity) were used as base data and then assembled to a synthetic utility value index. Among the different mathematical terms the most practice oriented synthetic characteristic results from the combination of additive and multiplicative coupling of base data. AS

FOOD MICROBIOLOGY AND HYGIENE

Enzymes

- 262 Koide (K) and Karel (M). Encapsulation and stimulated release of enzymes using lecithin vesicles. *International Journal of Food Science and Technology* 22(6); 1987; 707-723

Ethyl alcohol

- 263 Gibbons (WR). Batch and continuous solid-phase fermentation of Jerusalem artichoke tubers. *Journal of Fermentation Technology* ('Hokko Kogaku Zasshi') 67(4); 1989; 258-265

Two strains of *Kluyveromyces marxianus* were evaluated for their ability to ferment Jerusalem artichoke tuber pulp to ethanol under pH levels ranging from 2.0-6.3. Bacterial contamination was prevented in batch, solid-phase fermentation when pulp was initially adjusted to pH 3.5 or less, and maximal yeast populations occurred at pH 3.0-3.5. Fermentation times were also shortest for both yeast (13-18 h) and ethanol (48-64 h) production when pulp pH was in this range. However, ethanol yields (41-53% of theoretical) and fermentation efficiencies (68-78%) were somewhat lower than expected, with only 6.6-7.2% (v/v) ethanol produced by strain Y-1598 and 5.7-6.9% produced by strain Y-1550. Based on these parameters, the continuous solid-phase fermentor was operated for 396 h using strain Y-1598. The pH of pulp entering the fermentor was adjusted to 2.5 to compensate for partial neutralization by the mild steel of the fermentor. This resulted in fermenting pulp with a pH of 3.0-3.5, and therefore no contamination. Pulp exiting the fermentor after 72 h contained 6.9×10^6 yeast cells/ml and 7.3% ethanol, which represented 55.9% of the theoretical yield and a fermentation efficiency of 73.3%. Further modifications (partial and hydrolysis, finer grinding, etc.) should permit higher yields. AS

Fermented foods

Vinegars

- 264 Troncoso Gonzalez (AM) and Guzman Chozas (M). Metallic contaminants in Andalusian vinegars. *Nahrung* 32(8); 1988; 743-748

A study on the content of several metallic ions and arsenic in Andalusian vinegars has been carried out. The technique employed was atomic absorption spectrophotometry. The measurements were performed directly in the samples. The detn. of these ions is interesting since they can produce in certain amounts undesirable organoleptic effects or even make an attempt on the health (toxic elements). No kind of relevant contamination was found. AS

Microorganisms

- 265 Haas (GJ), Prescott (HEJr), Dudley (E), Dik (R), Hintlian (C) and Keane (L). Inactivation of microorganisms by carbon dioxide under pressure. *Journal of Food Safety* 9(4); 1989; 253-265

Carbon dioxide under pressure killed bacteria, molds and yeasts. The effect was synergistic with raised temp. and acidic pH and antagonized by lowered water activity. KMA

Bacteria

- 266 Patchett (RA), Kelly (AF) and Kroll (RG). Rapid detection of bacteria by an amperometric electrode system - a comparison of some redox mediators. *Food Microbiology* 6(3); 1989; 159-169

The rate of reduction of various mediators and mediator cocktails by *E. coli*, together with reoxidation currents at an amperometric electrode were examined. When used singly at their optimum concn., thionine, ferricyanide and 1,4-benzoquinone gave similar rates of current increase [$21.0-25.6 \text{ pA min}^{-1} (10^5 \text{ cfu})^{-1}$]. The presence of 1,4-benzoquinone enhanced the rate of reduction of low concn. (1mM) of ferricyanide but decreased the reduction rate at high concn. (28 mM) of ferricyanide. Applications of this mediator cocktail to the detection of pure cultures of *E. coli* allowed the detection of approx. 10^6 cfu mL^{-1} . However, the amperometric signal was increased to approx. $42 \text{ pA min}^{-1} (10^5 \text{ cfu})^{-1}$. However, when the method was applied to meat samples, bacteria were not detected due to the high level of background current. AS

Bacillus cereus

- 267 Kamat (AS), Nerkar (DP) and Nair (PM). *Bacillus cereus* in some Indian foods, incidence and antibiotic heat and radiation resistance. *Journal of Food Safety* 10(1); 1989; 31-41

Market samples of pulses, rice and rice products, oils, fish, meat specific milk products and ice creams were examined for the incidence of *Bacillus cereus*. This organism was found in 28.5% of rice and rice products (100% of boiled rice), 40% of fish, 80% of chicken and meat products, 30% of spices and 87% of ice creams. Pasteurized milk and milk products and protein rice food powder containing milk or cocoa were also contaminated with *B. cereus*. These isolates were resistant to 50 $\mu\text{g/ml}$ ampicillin but were susceptible to kanamycin (10 $\mu\text{g/ml}$) streptomycin (25 $\mu\text{g/ml}$), chloramphenicol (30 $\mu\text{g/ml}$) and tetracycline (10 $\mu\text{g/ml}$). KMA

Listeria

- 268 Beumer (RR) and Brinkman (E). Detection of *Listeria* spp. with a monoclonal antibody based enzyme linked immunosorbent assay (ELISA). *Food Microbiology* 6(3); 1989; 171-177

A monoclonal antibody-based ELISA method for the detection of *Listeria* spp. was evaluated for its ability to detect this organism in artificially contaminated food products. When the enrichment broth contained 10^6 cells/ml or more, independent of their physiological state, positive ELISA reactions were obtained. Some influence of product and/or competitive microorganisms could be detected. However to assure the successful application of ELISA efficient enrichment procedures are necessary, especially when *Listeria* spp. are present at low levels. AS

Staphylococcus

- 269 Gelosa (L). Valuation on the validity of two immunological methods for the staphylococcal enterotoxin determination in foods. *Industrie Alimentari* 27(262); 1988; 1069 (It).

Two immunological tests, one of reverse passive latex agglutination (RPLA) and the other of enzyme immune assay (ELIA), have been performed for the research of the staphylococcal enterotoxins produced by *Staphylococcus aureus* strains isolated from suspected foods, and for the direct research of the enterotoxins from food responsible of poisoning. The results reported in this preliminary investigation are rather discordant on the efficacy and efficiency of survey particularly for the reverse passive latex agglutination test. Therefore further researches are needed before the immunological tests are used for sanitary and legal actions in the alimentary field. AS

Fungi

Mushrooms

- 270 Burton (KS), Frost (CE) and Atkey (PT). Effect of vacuum cooling on mushroom browning. *International Journal of Food Science and Technology* 22(6); 1987; 599-606

The effects of two cooling methods and two storage temp. on mushroom quality, anatomy and wt. loss were compared. Mushroom quality was assessed as a function of cap browning and hyphal structure. Storage of mushrooms at 5 °C conserved quality and reduced wt. loss as compared with those stored at 18 °C. No differences in quality or hyphal structure were found between vacuum and conventionally cooled mushrooms when subsequently held at 5 °C; when cool storage was followed by a period at 18 °C vacuum-cooled mushrooms were significantly better with regard to colour (enzymic browning) than those conventionally cooled. The rate of wt. loss during storage at 5 °C was greater for vacuum-cooled than conventionally cooled mushrooms. AS

BIOTECHNOLOGY

Nil

TISSUE CULTURE

Nil

FOOD ADDITIVES

Antioxidants

- 271 Hrissafidis (D), Toth (L) and Messer (St). Production of curing smoke concentrates without water for the examination of their antioxidative activity. *FAT Science and Technology* 9(5); 1989; 207-210

Smoke concentrate without water has been prepared and its antioxidative capacity has been checked. The conc. based on acetic esters, which absorbs smoke and have better dispersion property than water. It is named as liquid smoke concentrate. N.

Colourants

Bixin

- 272 Srinivasulu (C) and Mahapatra (SN). A process for the isolation of bixin. *Research and Industry, India* 34(2); 1989; 137-138

A process for extraction of bixin from *Bixa orellana* (Annatto) which is being used as a natural colourant for food and dairy products has been described. The process involves extraction with ethyl acetate, desolventization and purification of crude solid by recrystallisation from ethyl acetate. Bixin was obtained as a violet crystal with m.p. 198 °C and an yield of 1.15%. KAR

Emulsifiers

- 273 Riego Martin (mB) and Gomez Herrera (C). Interfacial physical chemistry of food grade emulsifiers. Part II. Mechanisms for emulsion stability. Emulsions in typical processed foods. *Crasas Y Aceites* 39(2); 1988; 111-118

Flavourings

Vanilla

- 274 Riley (KA) and Kleyn (DH). Fundamental principles of vanilla/vanilla extract processing and methods of detecting adulteration in vanilla extracts. *Food Technology* 43(10); 1989; 64, 66, 68, 70, 75, 77

Review with 15 references. SRA

Stabilizers

Guar gums

- 275 Joginder Singh, Kaushal (GP) and Rajan Sood. A new flavonol glycoside from guar (*Cyamopsis tetragonoloba* L. Taub). *Journal of the Indian Chemical Society* 66(11); 1989; 833-834

A new flavonol tetraglycoside has been reported from guar, acid hydrolysis of flavonol glycoside gave myricetin, L-rhamnose and D-glucose. The absence of phenolic group at C-3 and C-7 of the flavonol tetraglycoside was also experimentally proved. KAR

Sweeteners

- 276 Shah (PM). Sweeteners from starch. *Indian Food Industry* 8(3); 1989; 13-15
- 277 Tunaley (A), Thomson (DMH) and McEwan (JA). Determination of equi-sweet concentrations of nine sweeteners using a relative rating technique. *International Journal of Food Science and Technology* 22(6); 1987; 627-635

The sweetness intensity of a 5% sucrose standard was compared with that of selected concn. of aqueous solutions of sucrose, fructose, glucose, sorbitol, lactitol, aspartame, saccharin, acesulfame K and a mixed extract of the leaves of *Stevia rebaudiana* Bertoni. Differences in sweetness were rated using a 150 mm continuous line scale, anchored at the extremities with 'Much less sweet' and 'Much more sweet' and at the mid point with 'Standard'. Analysis of variance was used to examine the effects of assessors, sessions, replicates, samples and interactions. Regression lines were fitted and equi-sweet concn. determined for each sweetener. Although the results indicated that it is more appropriate to consider an equi-sweet range for each sweetener, practical considerations necessitated the use of a single consensus concn. Variation in the data was sweetener dependent; the more complex the total perception associated with a sweetener, the more variable the results. AS

Aspartame

- 278 Balasubramanyam (BV). Aspartame. The New artificial sweetener. *Indian Dairyman* 41(11); 1989; 576-577

A brief general article covering method of aspartame preparation from phenylalanine and aspartic acid; extent of use of aspartame as a table-top sweetener in India for the diabetics and stability of aspartame. KAR

- 279 Van der Ven (AA). Aspartame. Properties and applications. *Industrie Alimentari* 28(267); 1989; 34-38 (It).

Describes aspartame properties, application and stability. BV

CEREALS

- 280 Aguerre (RJ), Gabitto (JF) and Chirife (J). Shape factors for the analysis of diffusion in air drying of grains. *International Journal of Food Science and Technology* 22(6); 1987; 701-705

The shape factors of different var. of wheat, corn (maize), rice, sorghum, sunflower seeds and soybean have been experimentally determined. Shape factor values ranged from 0.63 to 0.99. These values are useful for correcting literature moisture diffusion coeff. in grains of different shapes, obtained from the analysis of drying curves; this allows direct comparison of diffusivity in different grains. AS

Barley

Barley flour

- 281 Allison (MJ). Areas of absorption relating to malt extract values in modified near infrared spectra of barley flour. *Journal of the Institute of Brewing* 95(4); 1989; 283-286

Twentynine barley cvs were micromalted and the milling energy, nitrogen, acid soluble beta glucan and malt extract were determined. The whole meal of the unmalted samples were scanned over a near infrared spectrum and the scanned data was correlated with malt analysis data of the samples, to predict the malting quality of barley with special emphasis on malt extract. Predicted malt extract values resulting from an NIR multiple regression equation with principle component analysis terms correlated well ($r = 0.934$) with the normal extract values. The NIR spectrum was restructured according to weighting modified by the regression coeff. in the PC regression equation for hot water extract values and the restructured spectrum showed a number of absorption peaks & troughs. The strong peak at 2100 nm was correlated to positively to malt extract. Troughs at 2180 nm, 1980 nm and 1700 nm indicated a negative relationship between malt extract and protein. The wide troughs at 1830 and 2330 nm negatively correlated with malt extract and beta-glucan. NGM

Oats

Oat bran

- 282 Oakenfull (D). Oat bran. Does oat bran lower plasma cholesterol/and, if so, how?. *CSIRO Food Research Quarterly* 48(2); 1988; 37-39

Evidence from animal and human studies have shown that oat bran can effectively lower plasma cholesterol concn. There is a marked contrast to wheat bran and dietary fibre in general, which seem to have little or no effect on plasma cholesterol concn. Oat bran is a highly variable material. Different types of oat bran and oat products are likely to be highly variable in their effectiveness. SRA

Rice

- 283 Ajayi (OA) and Agun (AB). Effects of degree of parboiling on some quality parameters of rice. *Journal of Food Science and Technology, India* 26(5); 1989; 245-247

This investigation was carried out to study the changes in quality of processed rice due to parboiling. Samples of "OS6" var. of paddy was used for the exp. by cleaning the paddy before processing. The parameters studied are grain breakage swelling capacity and water absorption ratio. The steeping temp. was between 55 and 75 °C while steaming period was from 60 to 120 min. at atm. pressure. It was seen for a 16 h steeped paddy an acceptable parboiled product resulted at 65-75 °C soaking temp. and steaming periods between 90 and 110 min. The higher the soaking temp. the lower the breakage swelling capacity and water absorption ratio. With a longer steaming period the breakage decreased and also lowered the swelling capacity and water absorption ratio. NGKR

- 284 Bhaskar (G), Srivastav (PP) and Das (H). Effect of phosphate and citrate on quick-cooking of rice. *Journal of Food Science and Technology, India* 26(5); 1989; 286-287

The effect of phosphate and citrate on quick-cooking of rice viz. 'pankaj', var. was studied. This process involved rinsing of the rice in sodium bicarbonate followed by cooking in disodium phosphate and calcium citrate solution and finally drying in a cabinet dryer. The results showed that the treated rice cooked faster (3.7 times for raw rice and 1.2 times for parboiled rice) than the untreated rice. This was due to the loosening of the protein structure of raw rice and thus resulting in increase of water absorption. It was also found that the swelling, colour and appearance were slightly superior to those obtained from cooking untreated rice. NGKR

- 285 Owusu-Ansah (YJ). Polyphenoloxidase in wild rice (*Zizania palustris*). *Journal of Agricultural and Food Chemistry* 37(4); 1989; 901-904

In this study the presence of polyphenolase activity in wild rice (*Zizania palustris*) and its characterisation have been confirmed. It has been found by partial purification with acetone precipitation and dialysis of the crude extract. It yielded a 2.8 fold purification of the activity of the extract. The optimum pH and temp. of the enzyme were found to be 7.8 and 25 °C resp. and this enzyme was found to catalyze the oxidation of O-diphenols but not monophenols. NGKR

Rye

- 286 Rybka (K), Boros (D), Raczynska-Bojanowska (K), Rakowska (M), Sawicka-Zukowska (R) and Jedrychowska (B). Viscosity of rye grain components. *Nahrung* 32(8); 1988; 795-800

The viscosity of the water extract of rye grain correlates negatively with the protein digestibility in rats ($r = -0.82$). The extraction of pentosans and polyuronids from rye grain during at 25 °C

is paralleled by the increase in viscosity of the extracts; upon longer extraction the viscosity of the extracts is rapidly reduced despite still increasing the amount of extractable polysaccharides. The depolymerization of polysaccharides by the endogenous enzymes of rye grain or the microbial enzymes added results in a decrease of viscosity and increase of the body mass gain of chickens. AS

Wheat

- 287 Hagstrum (DW). Infestation by *Cryptolestes ferrugineus* (Coleopter: Cucujidae) of newly harvested wheat stored on three Kansas farms. *Journal of Economic Entomology* 82(2); 1989; 655-659

The vertical distributions of *Cryptolestes ferrugineus* (Stephens) in newly harvested wheat, *Triticum aestivum* L., on three Kansas farms during the first two months of storage were studied to characterize the process of infestation. In three bins, the number of adult *C. ferrugineus* tended to decrease from top to bottom layers of grain. In the fourth bin, the numbers decreased from top and bottom layers to middle layers. A regression model explained 82.2% of the variation between bins. These data suggest that most of the insect infestation occurred after the wheat was loaded into the bin instead of before or during loading and that insects then dispersed from the grain surfaces into the grain mass. AS

- 288 Nema (R), Sharma (YK), Bargale (M) and Raiput (LP). Physico-chemical and rheological characteristics of some wheat varieties grown in Madhya Pradesh. *Indian Journal of Nutrition and Dietetics* 26(2); 1989; 41-47

As the desirable features of finished products of wheat flour are related to the rheological and physico-chemical properties of the dough, these parameters were studied in six wheat var. grown in an Experimental Farm, Jabalpur, Madhya Pradesh, (India). The bran was removed by passing through a rice polisher which was ground in a traditional flour mill and sieved together fine flour (maida). Proximate analysis viz. moisture, protein, fat, total carbohydrates, alcoholic acidity, free fatty acids and gluten, sedimentation value, maltose value, damaged starch diastatic activity, colour grade of flour were estimated. The chemical comp. of wheat flour (maida) prepared through traditional milling compared well with reported values except for high ash content which is undesirable for breadmaking. Of all the var. only one var. (C-306) was observed to be superior in proximate comp., physico-chemical and rheological properties than other var. NGKR

- 289 Singh (DS), Sah (PC) and Singh (BPN). Milling characteristics of wheat straw. *Journal of Food Science and Technology, India* 26(5); 1989; 242-244

The present study deals with the performance size reduction system in respect of power consumption profile and the time needed to get five ground product in batch grinding of wheat straw in a lab. hammer mill. Commercial grade broken wheat straw of unknown var. was

used for this study and independent variables selected were particle size, grinding time, moisture content and clearance between the hammer blades. The dependent variables were power consumed or no load power consumed or load and wt. of the mass fractions retained on different sieves. The results showed that in batch grinding the interrelation among the size reduction of wheat straw power consumption characteristics and time needed to get five ground product the power requirement of the mill in grinding successively decreased with time and tend to stabilize at the end of grinding period. The plot of cumulative mass fraction with size showed that the ground product had almost a similar distribution trend in all cases. NGKR

Wheat bran

- 290 Nakadai (T) and Nasuno (S). Enzyme preparation from extract of wheat bran koji by alcohol precipitation. *Journal of Fermentation Technology* '(Hokko Kogaku Zasshi') 67(4); 1989; 253-257

A method for the preparation method of enzymes for Shoyu making was studied. When enzyme proteins were extracted with water from a column of wheat bran koji culture of *Aspergillus oryzae* 460, the tailing phenomenon resulted in low recovery. However, a better yield was obtained by the use of the solution passed at the latter stage of extraction as the extraction liquid for the succeeding extraction. Thus, in case of leucine aminopeptidase (Leu-Gly-Gly as substrate) the extraction yield reached 89%. Considering the extraction yield and the amount of alcohol required to precipitate enzyme proteins, an appropriate volume of extract was found to be 1.5 to 2 times the amount of wheat bran koji. Moreover, less sporulation of koji culture due to a shortening of the culture time to 48 h by the use of germinated spores as seed culture, resulted in less water repellence and a higher yield of extraction of enzymes than in the old culture (58.5 h). The temp. of the mixture of extract and alcohol should be kept at 5 °C to increase the yield of leucine aminopeptidase and acid carboxypeptidase. By the concn. of enzyme proteins through ultrafiltration, the use of alcohol could be reduced, and an enzyme preparation with high specific activity and recovery could be obtained. AS

MILLETS

Corn

- 291 Hardwick (JE) and Glatz (CE). Enzymatic hydrolysis of corn gluten meal. *Journal of Agricultural and Food Chemistry* 37(4); 1989; 1188-1192

Corn gluten meal was hydrolyzed with Alcalase 2, 4L, an alkaline protease. The effects of enzyme concn. and gluten size reduction on the hydrolysis were studied. Extent of reaction was expressed in terms of both the degree of hydrolysis (using the pH-stat technique) and the concn. of soluble protein. Linear and product inhibition kinetic models were compared to the experimental results after param-

ter estimation by minimizing the residual sum of squares. The models describe the time-dependent behaviour of three protein/peptide pools—insoluble protein, TCA-insoluble proteins, and TCA-soluble peptides. A simplified product inhibition model gave the best fit to the experimental data. AS

- 292 Onigbinde (AO) and Akinyele (IO). Effect of water activity on the heat-induced deterioration in the protein digestibility of corn (*Zea mays*) and cowpeas (*Vigna unguiculata*). Food Chemistry 33(3); 1989; 215-224

Flour of corn (*Zea mays*) adjusted to 0.35, 0.56 and 0.75 water activity and flour of cowpea (*Vigna unguiculata*) adjusted to 0.33, 0.55 and 0.75 water activity, were, resp. stored at 80, 100, 120 °C for 6 h. Analysis of the samples at 1 h intervals showed that the protein digestibility (PD) increased to a max. during the first 60 min. followed by progressive decrease with time. The PD was more affected by temp. and time, than water activity ($P = 0.01$). Both the activation energy (EA) and temp. coeff. (Q_{10}) tend to increase with increased water activity. The EA (KJ/mol) ranged from 14.2 to 19.7 and 18.8 to 29.1, while the Q_{10} ranged from 1.14 to 1.20 and 1.19 to 1.32 for corn and cowpea, resp. The net percentage decrease in PD and the long half lives (27-133 h) showed that 6 h was too short for first order kinetics to be confirmed. The max. decrease of 9.3% PD in cowpea and 11.5% PD in corn (0.33 water activity; 120 °C) could be of nutritional significance. AS

Corn flakes

- 293 Midden (TM). Twin screw extrusion of corn flakes. Cereal Foods World 34(11); 1989; 941-943

This feature article discusses the advantages of corn flakes production by twin screw extrusion as compared to traditional method. The author reported 11% saving in the processing cost when extrusion method was used because of lower cost of raw materials energy and labour. PHR

Sorghum

- 294 Pretorius (HE) and du Plessis (LM). Determination of total grain surface waxes using the Iatroscan-Chromarod technique. FAT Science and Technology 91(5); 1989; 200-203

The Iatroscan-Chromarod system was used for qualitative and quantitative detn. of the total surface waxes of sorghum grain. Grain pearling efficiency was evaluated by comparing the polar compounds extracted with hot benzene at different stages of pearling. Extracted waxes were used as a natural standard to compile a calibration curve for quantitative detn. A quadratic equation $y = a + bx + cx^2$ was fitted to the areas of standard solutions ranging from 2 to 20 µg/ul. Results were in close agreement with gravimetric determinations and literature values. AS

Sorghum flakes

- 295 Al-Kahtani (HA). Processing of different wheat flour-supplemented sorghum flakes (sorghum and wheat of Saudi Arabia). Sensory, nutritional, and microbiological evaluation. Food Chemistry 33(2); 1989; 133-149

Sorghum-based flakes were produced alone and with 10 and 50% blends of different wheat flour (75% extraction rate). Sensory, chemical, nutritional, and microbiological evaluation of the flakes were investigated. Panellists (n = 20) rated the sensory characteristics and found to significant difference in overall acceptability between sorghum- and wheat-supplemented sorghum flakes. Wheat supplementation increased protein and total sugar contents but decreased fat, ash, and crude fibre. Mineral comp. of the flakes generally showed an abundance in Na, K, Mg, P and Fe but shortages in Ca and Cu. However, the 50% wheat replacement resulted in higher Fe but lower P and Zn contents. The 50% blend increased lysine, histidine, arginine, proline, and glutamic acid but decreased leucine and alanine. In general, Saudi No. 4 wheat flour-supplemented flakes had the best amino acid profile. Chemical scores for all samples were higher than those of most similar commercial breakfast cereals. However, lysine and methionine cystine were still the limiting amino acids. Total microbial counts, moulds and yeast counts, total coliforms, and spore-formers were very low or absent in all flakes. AS

PULSES

- 296 Kurien (PP) and Patil (BS). A hand-operated small-scale pulse dehusking machine for rural use. Research and Industry, India 34(3); 1989; 213-216

A simple hand operated pulse dehusking machine has been described useful for small scale processors. It consists of an emery coated metal cone fixed to vertical shaft rotating inside a conical wire mesh screen. The unit is operated by a handle and bevel arrangement. Arrangement is made to raise or lower the cone. A dust cover with a hopper at top envelops the screen. Another hopper collects the mill stream which come out through a chute. The husk of bold grains like Bengal gram and red gram are initially loosened by soaking in water and sun-drying. Winnowing and sieving separates the dhal (Cotyledons) from the husk. The yield of dhal is 75-80% from Bengal gram and red gram. KAR

Peas

- 297 Collins (MA) and Buick (RK). Effect of temperature on the spoilage of stored peas by *Rhodotorula glutinis*. Food Microbiology 6(3); 1989; 135-141

The population of the psychrotrophic pink yeast *Rhodotorula glutinis* FMT157 increased in numbers on blanched, surface sterilised peas stored at temp. in the range -18 to 15 C. The duration of lag phase

and rate of growth were directly related to incubation temp. Yeast growth was limited by the total quantity of carbohydrate available in the peas. Flavour changes determined by the analysis of headspace volatiles showed that although alcohols and ethanol were isolated from both inoculated and uninoculated pea samples, considerably more hexanal was detected in yeast inoculated samples earlier in the incubation period, indicating a higher level of lipid oxidation due to lipoxxygenase activity. Thus it would appear that yeast derived enzymes were compensating for loss of similar pea derived enzymes destroyed by the blanching process prior to freezing. In addition 2-methyl furan was formed in yeast inoculated peas at temp. $< 5^{\circ}\text{C}$ leading to a more objectionable flavour change than in inoculated peas incubated at higher temp. Thus control of the yeast contamination of peas and storage at temp. $< 18^{\circ}\text{C}$ appear to be necessary to ensure a commercially acceptable shelf-life for frozen peas. AS

OILSEEDS AND NUTS

Arecanuts

- 298 Prakash (TN), Lalith Achoth, Mallikarjunaiah (KG). Processing and marketing of arecanut in Karnataka. An economic analysis. Indian Cocoa, Arecanut & Spices Journal 12(4); 1989; 109-112

Cost of processing Saraku and Chali type of arecanuts, by small and large farmers in Shimoga district of Karnataka State (India) was surveyed by personal interview. Cost calculation was done based on the investment on building, equipment, labour and interest on establishment. The cost of processing Saraku calculated comes to Rs. 503.96 for large farms and Rs. 616.63 for small farms whereas for Chali it works out to Rs. 377.60 and 280.55 for large and small farms, resp. KAR

- 299 Raisuddin and Misra (JK). Effect of preservatives and fungicides in arresting fungal infestation over marketed betel nut (Areca catechu L.). Journal of Food Safety 10(1); 1989; 1-9

Different treatments were given to control the fungal infestation in betel nut. A temp. of 60°C for 6 h completely inhibited fungi. Fungal growth was completely suppressed by 5% boric acid and 1% propionic acid treatment. Dithane M-45 was quite effective at 0.2%. KMA

Brazil nuts

- 300 Secor (CL) and Lisk (DJ). Variation in the selenium content of individual brazil nuts. Journal of Food Safety 9(4); 1989; 279-281

The average concn. of Se in Brazil nuts was 14.66 p.p.m. The variation in Se content in nuts was attributed to soil content of Se. KMA

Groundnuts

- 301 Arthur (F). Pests of stored peanuts. Toxicity and persistence of chlorpyrifosmethyl. *Journal of Economic Entomology* 82(2); 1989; 660-664

Virginia type peanuts were treated with 5, 10, 20 and 30 p.p.m. chlorpyrifosmethyl and infested with fifth-instar almond moth, *Cadra cautella* (Walker), and Indianmeal moth, *Plodia interpunctella* (Hubner) at T_1 , T_{60} , T_{120} , T_{180} , and T_{270} (days after application). Rates of 5 and 10 p.p.m. did not kill almond moth larvae at T_1 and rates of 20 and 30 p.p.m. were only marginally effective. Indianmeal moth larvae were more susceptible to chlorpyrifosmethyl than were almond moth larvae, but only the 20 and 30 p.p.m. rates gave control at T_1 . Adult red flour beetles, *Tribolium castaneum* (Herbst) and merchant grain beetles, *Oryzaephilus mercator* (Fauvel), were also tested at T_1 , T_{60} , T_{120} , T_{180} , and T_{270} . Rates of 20 and 30 p.p.m. were effective against both beetle sp. for at least 180 d after application. AS

Pecans

- 302 Paster (N), Gagel (S) and Menosherov (M). Pecan quality after harvesting and moulding of different varieties stored at high relative humidity. *International Journal of Food Science and Technology* 22(6); 1987; 677-681

Pecan nuts stored in their husks may be subjected to rapid mould deterioration. A study was designed to determine quality characteristics of pecan stored for 7 days before shelling. In addition, the moisture absorption of dry pecans and the increase in mould population of three var. (Delmas, Moneymaker and Choctaw) stored under controlled conditions of 26 ± 1 C and 85% RH were investigated. When pecan nuts with husks were stored for 7 days in metal bins soon after harvesting, temp. inside the bulk rose from 24 to 33 C. However, no notable increase in free fatty acids or in peroxide value of the nut meals was recorded. The moisture content of pecan meat influenced fungal infestation: e.g. the moisture content of var. Money maker increased rapidly during storage and the final fungal count on this var. was relatively higher than other var. The increase in both parameters in Delmas was slower and a smaller fungal population was recorded at the end of the trial. AS

Rapeseeds

- 303 Fiebig (HJ), Sendfeld (A), Jorden (M) and Aitzetmuller (K). Investigation on the determination of total glucosinolate content in rapeseed. *FAT Science and Technology* 91(7); 1989; 266-271 (De).

A new, quick and sensitive chromatographic method for detn. of total glucosinolate in rapeseed is described. Glucosinolate is hydrolysed by enzyme myrosinase into glucose, sulphate ion and isothiocyanates and sulphate ion is estimated by ion-chromatography. N

- 304 Kroll (J), Kujawa (M) and Baumgrass (R). The influence of mechanolytic procedures on the content of antinutritive compounds in rapeseed. *Nahrung* 32(8); 1988; 801-802

As already described the mechanolysis is an useful method for improvement of functional properties of protein preparation caused by changes of structures, splitting of covalent bindings and by combining of mechanolytical and chemical modification. In connection with an aimed decomposition of antinutritive compounds of rapeseeds (first of all of glucosinolates) the mechanolysis is not used as far as we know. For a decrease of destruction resp. of toxic compounds of rapeseeds numerous treatments (processes) have been described including the treatment of seeds or meals with heavy metals. The disadvantages of this metal treatment methods is the relatively high amount of needed heavy metals (about 1% or more). In the case of Cu + this concn. could cause toxic effects in animals after feeding. It is found, that a mechanolytical treatment of rapeseed meal in presence of comparatively small content of heavy metal ions is a way to reduce the content of VOT and progoitrin of these preparations. Further more the mechanolysis leads to inactivation of myrosinase. AS

Sesame

- 305 Amin (D) and Kothari (IL). Seed composition of some new varieties of sesame. *Journal of the Oil Technologists' Association of India* 21(1); 1989; 15-16

Fourteen new sesame seed var. evolved at main Oilseeds Research Station, Gujarat Agricultural University, Junagadh, have been analysed. The seed characteristics varied as follows; oil, 33.18-42.34%, moisture, 3.41-5.13%, protein 24-28%. Oil characteristics were: iodine value, 97.08-107.25%, saponification value 187.93-218.79; peroxide value, 19.76-19.83; acid value, 3.92-7.29; oleic acid, 39.08-48.72%; linoleic acid, 35.37-44.56%; palmitic acid, 9.09-15.59%; stearic acid, 3.80-6.0%. Among the var. highest oil content (42.34%) was found in A-6.5 var. There was not much variation in their moisture and protein contents of different var. KAR

Soybeans

- 306 Smita Nilegaonkar, Vaishali Agte. Induced variation in chemical composition of black seeded soybean variety-Kalitur. *Journal of Food Science and Technology, India* 26(5); 1989; 256-258

In this paper studies were made for seed protein fractions by electrophoresis and solubility, assay for trypsin inhibitor and nutritive value by proximate analysis to understand the biochemical changes and nutritional performance of the mutants. "Kalitur", a black seeded soybean var. was exposed to physical and chemical mutagens and subsequently studied for changes in electrophoretic and solubility behaviour of proteins, trypsin inhibitor activity and proximate analysis. It was seen that mutation induced changes in protein structure and lowered the fat percentage. In addition a mutant var. "Macs 107" was found to be better than "Kalitur" in having trypsin inhibitor

activity lower by 15%. NGKR

- 307 Subba Rau (BH) and Prasannappa (G). Studies on the physico-chemical parameters of expanded soybean. *Journal of Food Science and Technology, India* 26(5); 1989; 252-255

The available information on the soybean processing was utilised by using expanded soybean dhal in snack foods. It was seen that longitudinal expansion was over by 50% of its length whereas the increase in width and thickness was marginal. The bulk density reduced by 60% and the overall expansion was in the order of 30-40%. The recovery of the dhal was 68-70% of the raw seeds and most of the trypsin inhibitors were destroyed during processing. The quality of the soybean dhal was comparable to that of groundnut kernel in respect to hardness. NGKR

Soy products

Soy beverages

- 308 Hung (TV), Kyle (WSA) and Yu (RST). Rapid estimation of protein in soy beverage by infrared spectroscopy. *ASEAN Food Journal* 4(2); 1988; 65-66

Soybean flour

- 309 Sahay (KM) and Kachru (RP). Development and evaluation of an extruder for soy flour products. *Indian Journal of Agricultural Sciences* 59(7); 1989; 478-481

This is a modified version of the earlier developed screw type extruder. In this cooker instead of the screw rotating, a piston and cylinder mechanism is provided, where it presses the material which moves through the die. The specifications worked out are given and the preparation of flour blends is described and the power requirement of extrusion with different flour blends has been worked out. The cost of the equipment is Rs. 3200. Sensory evaluation by a taste panel indicated that the products were well liked and a blend of 40% sago flour gave good and improved taste, colour and texture; blend of 20% soy flour with 40% each of rice and sago flour also gave good product. KAR

Sunflowers

- 310 Durante (M), Bernardi (R), Lupi (MC) and Sabelli (P). Characterization of *Helianthus annuus* L. storage proteins. *Journal of Agricultural and Food Chemistry* 37(4); 1989; 852-855

A new rapid method for the extraction of sunflower seed (*Helianthus annuus* L.) globulins has been proposed in which the proteins can be extracted from a little portion of each seed without contamination of albumins and chlorogenic acid. In this paper the results on characterisation of globulins extracted by this technique have been compared with results reported by other authors. The variations in

polypeptide subunits are examined by electrophoretic analyses of globulins extracted from seed of selfed lines. It has been seen that the native protein shows an apparent mol. wt. of 300 k but alternatively a 190 k band is present in some selfed lines of sunflower. The evidence was found for four major components with mol. wt. 39.2, 32.5, 25.6, and 23.2 k each containing two polypeptides and some minor polypeptides. In the 190 K protein the 32.9 component was absent. NGKR

TUBERS AND VEGETABLES

- 311 Adhikari (J), Adhikari (S) and Achaya (KT). Glucosinolates in the seeds of Indian Brassicas and *Eruca sativa*. Journal of the Oil Technologists' Association of India 21(1); 1989; 13-14

The proportions of various alkyl thiocyanates have been determined, and the quantities of the corresponding glucosinolates calculated, in seeds of cv. of Indian brassicas, which include the subspecies *rai* (*Brassica juncea*), *sarson* (*Br. campestris* var. *sarson*) both brown and yellow types and *toria* (*Br. campestris* var. *tori*), and in the related *jamba* (*Eruca sativa*). In all these seeds, butenyl isothiocyanate, corresponding to the glucosinolate gluconapin, constitutes the main component, accompanied by distinctive proportions of other glucosinolates. The quantities of the glucosinolates sinigrin, gluconapin, glucobrassicinapin and others; corresponding resp. to propenyl (allyl), butenyl, pentenyl and other isothiocyanate expressed as % dry basis of seed, were: *rai* (3 cv.) 0.34-0.38, 3.1-3.6, 0.02-0.03, 0.02-0.04, brown *sarson* (5 cv.) Nil-0.05 (with one abnormal figure of 0.24), 2.86-4.16, Trace, and Nil-Trace (with one figure of 0.12), yellow *sarson* (2 cv.) 0.02, 3.3-3.5, 0.02, nil, *torie* (4 cv.) nil - 0.03, 4.1-5.3, 0.01-0.03 and 0.09-0.18, and *jamba* (one cv. only) 0.05, 2.8, 0.15 and 0.01 resp. Considering the distinctive taste and flavour of each alkyl thiocyanate, the use of mixed seeds in traditional crushing finds justification. KAR

Onions

- 312 Tomasicchio (M), Andreotti (R) and Palmieri (B). Study of the lactic acid fermentation of onions. *Industria Conserve* 64(1); 1989; 28-31 (It).

The effect of some parameters (peeling, salt content of brine, temp.) on the lactic-acid fermentation of onions was investigated. To this end, peeled and unpeeled onions were fermented at three different temp. (18, 25 and 30 °C) in brines with 10 and 12% salt content. Results showed that unpeeled onions gave a well-fermented higher-quality products. The lowest temp. used did not allow complete fermentation to be reached (pH greater than or equal to 4.5). At the two other temp. fermentation took place more freely in the 100% brine. AS

Cassava

- 313 Ukhun (ME) and Nkwocha (FO). The hydrocyanic acid (HCN) content of garri flour made from cassava (*Manihot* spp.) and the influence of length of fermentation and location of source. *Food Chemistry* 33(2); 1989; 107-113

White and yellow garri flour-products derived from cassava (*Manihot* spp.) roots-collected from fifteen locations in Nigeria, were analysed for their HCN contents using the alkaline titration method of the Association of Official Analytical Chemists (AOAC) (1970) and the alkaline picrate method of Williams & Edwards (1980). Garri flour was also produced from meashed cassava roots which had been subjected to fermentation for time periods of between 0 and 72 h, and HCN levels monitored by the two indicated methods. HCN levels were influenced significantly by the source of the flour, the type of flour (whether white or yellow), the method of detn. and the length of fermentation of the grated cassava mash. It is suggested that these factors should be taken into consideration in the evaluation of the products for toxicity. AS

Tubers

Potatoes

- 314 Bolzoni (L) and Bandini (M). Protham and chlorprotham residues in potatoes. *Industria Conserve* 64(1); 1989; 38-41 (It).

An analytical method for determining protham and chlorprotham residues in potatoes is described. The residues are extracted with dichloromethane and cleaned-up by chromatography on a Florisil Sep-Pak cartridge before quantitative detn. This is carried out by gas chromatography with two detection system, viz. the thermoionic nitrogen-phosphorus detector and mass spectrometry. The sensitivity of the method is 0.01 p.p.m. for both pesticides. AS

- 315 Kumar (R) and Mukherjee (D). Sprouting and free amino acid changes in potato tubers with pre-harvest maleic hydrazide treatment. *Indian Journal of Horticulture* 46(1); 1989; 66-72

Standing crop of potato was sprayed with 0, 750, 1000 and 1500 p.p.m. of maleic hydrazide (MH) 40 days before harvest to control sprouting in post harvest crop. Soon after harvest these potatoes were placed at room temp. (31 plus or minus 2 °C) for 3 days followed by storing in cold storage for 105 and 194 days. Various concn. of preharvest MH treatments could not inhibit sprout initiation but were very effective in checking the sprout length. MH reduced the sprout wt. of tubers, but did not prevent rotting. The treated tubers had higher free pool of amino acids compared to the control. Thirty day storage caused a significant increase in the total free amino acids of untreated and treated tubers. KAR

Potato flour

- 316 Nanda (P) and Khanna (P). Nutritive value and shelf-life of home based potato flour. Indian Journal of Nutrition and Dietetics 25(9); 1988; 288-291

Household method for potato flour preparation, its nutritive value, shelf-life and sensory quality of its recipes prepared for weaning infants and children are reported. Consumption of 100 g of potato flour provides nutrients between 2.8 and 4.5 times than that provided by an equal quantity of raw tuber. Replacement of potato flour wholly or partially in place of cereals in preparing the recipes did not show any adverse effect on appearance, colour, taste or texture. Potato flour has a shelf-life of 21 days and hence is recommended to be used as a subsidiary food in place of cereals in a few recipes. NGKR

Yams

Yam chips

- 317 Adeyanju (SA) and Ikotun (T). Microorganisms associated with mouldiness of dried yam chips and their prevention. Nahrung 32(8); 1988; 777-781

The broad objective of this study was to isolate and identify the microorganisms causing mouldiness of stored yam chips and to look for ways of preventing the problem. Microorganisms isolated included *Aspergillus flavus*, *A. glaucus*, *A. nidulans*, *A. niger*, *A. ochraceus*, *A. tamarii*, *A. candidus*, *Penicillium oxalicum*, *Trichoderma longibrachyatum*, *Rhizopus nigricans*, *Cylindrocarpon radiculicola*, *Neurospora crassa*, *Botryodiplodia theobromae*, *Bacillus subtilis*, *Bacillus cereus*, *Erwinia carotovora* and *Serratia marcescens*. Some of these microorganisms are transient invaders. Of the calcium-based chemicals used to prevent mouldiness, only calcium carbonate and calcium hydroxide proved effective and also prevented infestation of the chips by storage pests throughout the period of study. Whereas the product of the untreated yam chips was preferred in terms of colour, the product of calcium carbonate and calcium hydroxide treated yam chips were preferred in terms of taste and texture. As for physiological reaction after eating the products of the treated chips, calcium hydroxide treated chips seemed to be more preferred by the members of the tasting panel. AS

Vegetables

- 318 Bautista (OK), Kosiyachinda (S), Rahman (ASA) and Soenoeadji). Traditional vegetables of ASEAN. ASEAN Food Journal 4(2); 1988; 47-58
- 319 Daniel (M). Polyphenols of some Indian vegetables. Current Science 58(23); 1989; 1332-1334

16 leafy and fruit vegetables were examined for the presence of 14 polyphenols. Leaves of all the leafy vegetables examined contained

various flavonoids. Flavonols were found in all the vegetables contained quercetin and/or kaempferol and their various methoxylated derivatives. The 6/8 -hydroxylated flavonols gossypetin and quercetagetin were found in Moringa leaves. In cabbage and Hibiscus sabdariffa flavonols were present in traces. The leaves of Colocasia contained flavones (apigenin and luteolin) instead of flavonols. None of the plants screened contained glycoflavones. Proanthocyanidins were seen in the leaves of Moringa while anthocyanins were located in H. sabdariffa and Impomea aquatica. KAR

- 320 Pizzocaro (F), Gasparoli (A), Boschetti (T), Ricci (R) and Zanetti (L). New aspects of heat inactivation in vegetables before freezing. Note II. Enzymatic activity and fatty acid composition in frozen vegetables. *Industrie Alimentari* 28(270); 1989; 392-397, 402

The stability of the fatty acid comp. during frozen storage at -20 °C has been studied on raw and blanched (varying degrees) samples of french bean, squash and Asparagus, in relation to peroxidase and lipoxigenase activities. The peroxidase activity (soluble form), initially present in non-treated vegetables, can be expressed by the ratios 0.28 : 1.0 : 0.06 (French bean : squash : asparagus); the lipoxigenase activity 1 : 0.01 : 0.58. Drying frozen storage (9 months) the soluble peroxidase considerably decreases in the non treated vegetables, whereas the ionically bound peroxidase (determined in the squash only) is more cryoresistant. In its turn the lipoxigenase activity decreases more in the french bean and in the squash than in asparagus. The residual enzymatic activity in blanched samples tend to decrease as well. However temp. phenomena of regeneration have occurred occasionally. The linoleic and linolenic acids decrease in the raw vegetables after 9 months of 10.8 and 21.8% (french bean), of 0.0 and of 7.4% (squash), of 11.2 and 31.3% (asparagus) resp. In the inactivated vegetables these decrements are not remarkable if the heat treatment is enough to inactivate totally the lipoxigenase activity. Since the linolenic acid (diunsaturated), the decrements noticed may be considered as the results of the oxidation catalyzed by the lipoxigenase and by the non-enzymatic lipid oxidizing activity. AS

Brussels sprouts

- 321 Springett (MB) and Adams (JB). Properties of Brussels sprouts thioglucosidase. *Food Chemistry* 33(3); 1989; 173-186

Some important properties of Brussels sprouts thioglucosidase have been studied using ammonium sulphate precipitates. The enzyme activity followed Michaelis-Menten kinetics with sinigrin as substrate. Ascorbic acid was shown both to activate and to inhibit the thioglucosidase with an optimum activity at 10 mM ascorbate. Two pH optima were observed at pH 6-6.5 and pH 8, possibly indicating the presence of different isoenzymes. Thioglucosidase was completely inhibited on freezing in aqueous conditions at -6 and -12 °C but was active at these temp. in 35 % (w/w) glycerol. A temp. optimum activity at about 50 °C was found and, at higher temp. (60-90 °C), the enzyme was thermally inactivated by a complex mechanism. Using extracts from different regions of Brussels sprouts, it was found that

the majority of the thioglucosidase activity was in the outer leaves.
AS

Cucumbers

- 322 Kanwar (JR) and Sharma (PR). Studies on the chemical and elemental analysis of cucurbit kernels and their seed coats. *Indian Journal of Nutrition and Dietetics* 26(2); 1989; 34-40

Seeds of cucumber (*Cucumis sativus*) and bottle gourd (*Lagenaria vulgaris*) procured from the vegetable seed farms of Punjab Agricultural Univ. Ludhiana, India, were analysed for moisture, ash, ether extracts, crude fibre and N, non-reducing and total sugars. The ether extract of the kernel was 44.4 to 46.3%. The seed coats were very poor in fat and protein but high in crude fibre. The kernels were rich in minerals specially P, K, Mg, Fe, S, Cu, Mn and Zn. The ether extract of the kernels of sp. varied between 44.4 and 46.3%. The crude protein content of kernels varied between 30.7 and 31.3%. As these are potential sources of oil and protein need has been stressed to extensively grown, collect and utilize their seeds for oil and protein production in order to save valuable foreign exchange and alleviate their acute shortage. NGKR

Melons

- 323 Ezeike (GOI). Hygroscopic characteristics of unshelled egusi (Melon) seeds. *International Journal of Food Science and Technology* 23(5); 1989; 511-519

Desorption characteristics of unshelled egusi seeds was determined to improve drying and reduce storage losses in shell before processing. A simple procedure was developed using the Clausius-Clapeyron equation for calculating the isosteric heat of sorption, which was found to decrease with increase in moisture content of the crop. SRA

Pumpkins

- 324 Teotia (MS), Ramakrishna (P), Berry (SK) and Kaur (S). Some engineering properties of pumpkin (*Cucurbita moschata*) seeds. *Journal of Food Engineering* 9(2); 1989; 153-162

To explore the possibility of developing a similar or alternative mechanical dehulling process, the engineering properties of pumpkin seeds, kernels and hulls were studied. The results showed that it is possible to dehull the seeds mechanically by a system in which the sharp tips of the seeds impinge on a hard surface. It is also possible to separate kernels, hulls and any unhulled seeds in suitable equipment using the differences in their properties such as surface roughness, densities and transport velocities. SRA

Tomatoes

- 325 Floros (JD) and Chinnan (MS). Determining the diffusivity of sodium hydroxide through tomato and capsicum skins. *Journal of Food Engineering* 9(2); 1989; 129-141

An experimental method to measure the effective diffusivity of chemical substances through the skin (exocarp) of fruits and vegetables is described. A circular disk of skin was placed in a specially constructed diffusion cell to separate two flowing solutions. Changes in concn. with time were monitored and the diffusion properties were estimated from Fick's diffusion equation. The calculations were based on results taken either in the early transient period or in the late period of steady-state flow. The method and the design of the diffusion cell allowed measurements with negligible edge effects and rapid detection of errors due to leaks or contamination. Diffusion characteristics were determined for the penetration and movement of sodium hydroxide through the skins of tomatoes and pimiento peppers. The diffusivity through tomato skin was $2.0 \times 10^{-8} \text{ cm}^2 \text{ s}^{-1}$ and through pimiento pepper skin $5.5 \times 10^{-8} \text{ cm}^2 \text{ s}^{-1}$ at 72 C. Results were reproducible and agreed with previous studies. AS

- 326 Jimenez (L), Ferrer (JL) and Paniego (LM). Rheology, composition and sensory properties of pulped tomatoes. *Journal of Food Engineering* 9(2); 1989; 119-128

The rheological behaviour of batch-sterilized and flow-sterilized (HTST) pulped tomatoes was measured with the aid of a rotary viscometer and compared with that of fresh pulped tomatoes. These products are pseudoplastic and thixotropic, and have a definite yield stress. The yield stress, consistency coeff. and pseudoplasticity decrease in the order: fresh, HTST-sterilized rheological model based on the destruction of the product structure reveals that the structure's destruction rate increases in the order: fresh, batch-sterilized and HTST-sterilized product. The batch-sterilized product has a smaller content of pectins, insoluble solids and, especially, vitamin C. However, the sugar and soluble-solids contents and the pH are similar for all three products. The sensory tests carried out indicate significant differences (5% level) in colour, aroma, flavour and texture, between all three products. The fresh product is clearly preferable to the batch-sterilized product. AS

- 327 Pirone (G), Mannino (S) and Vicini (E). Heat resistance of *Bacillus coagulans* spores in strained tomatoes. *Industria Conserve* 64(1); 1989; 18-20 (It).

Heat resistance of *Bacillus coagulans* spores in strained tomatoes was determined at temp. of 88, 90, 93, 96 and 98 C and pH values ranging from 4.2 to 4.5. Tryptone soy agar was used as the medium for recovering surviving spores. Within the temp. range 90-98 C, decimal reduction times decreased with decreasing pH. Extrapolation to 100 C gave D_{100} values of 2.57, 2.88, 3.01 and 3.09 min. at pH 4.2, 4.3, 4.4 and 4.5 resp. At 88 C, for all pH values heat inactivation curves

were non-logarithmic, so that D values could not be obtained. AS

- 328 Tong (CBS) and Gross (KC). Ripening characteristics of a tomato mutant, dark green. Journal of the American Society for Horticultural Science 114(4); 1989; 635-638

Respiration, ethylene production, firmness, polygalacturonase activity, cell-wall comp. and soluble uronide content were measured during ripening of two tomato genotypes i.e. 'Manapal' and 'dark green' (DG). The data suggest that firmness differences between DG and 'Manapal' fruit are not due to differing activities of polygalacturonase or changes in cell wall comp. during ripening but to other factors that may affect solubilization of cell wall uronides. BAP

Tomato products

- 329 Vicini (E), Mannino (S) and Pirone (G). Ability of a *Bacillus coagulans* strain isolated from a flat sour outbreak to grow in tomato products of various concentration. Industria Conserve 64(1); 1989; 13-17 (It).

Spores of a *Bacillus coagulans* strain isolated from a flat-sour outbreak of mixed tuna-tomato sauce packed in laminated cartons were tested for capacity of germination and outgrowth in strained tomatoes. Small jars of strained tomatoes adjusted to pH values of 4.1, 4.2, 4.3, 4.4 and 4.5 were inoculated with 10^2 , 10^3 and 10^4 /ml spore levels, air or vacuum sealed and incubated at 30, 37, 42 and 55 C. Min. pH for growth was found to be 4.2, under both anaerobic and vacuum conditions; at this pH growth occurred in 7 to 14 days as a function of temp. and inoculum size. The growth of the strain was accompanied by a decrease in pH and vacuum. AS

Tomato ketchup

- 330 Porretta (S), Sandei (L) and Leoni (C). Commercial quality classification of tomato ketchup. Industria Conserve 64(1); 1989; 21-27 (It).

A detailed study of the chemical comp. of ketchup was undertaken. In particular, in order to obtain a useful tool for determining min formulation requirements for this products, a number of samples taken from the Italian market were analyzed for soluble and total solids, ash, K, Ca, NaCl, electrical conductivity, pH, titrable acidity, citric acid, DL-lactic acid, sugars (fructose, glucose and sucrose) consistency (Bostwich and Blotter test), lycopene, 5-hydroxy-2-methyl-furfural, tomato ketchup colour score, water-soluble colour of the liquid portion, water activity. Moreover, by using statistical discriminant analysis a quality-classification method was developed which is connected with some chemical parameters rather than with sensory evaluation, particularly difficult for ketchup because of its comp. The analysis yielded a significant function which allowed about 86% of the samples to be correctly classified. The discriminant function is as follows: $Y = 0.398a_L + 0.382 b_L + 0.365 \text{ citric. ac.} - 0.393 \text{ titr. acidity.}$ AS

FRUITS

- 331 Melvin Couey (H). Heat treatment for control of post-harvest diseases and insect pests of fruits. HortScience 24(2); 1989; 198-202

Certain regulatory restrictions on the use of certain chemical fumigants and pesticides in the recent yrs making the free use and availability of these chemical difficult to presence. Therefore heat-treatment techniques have been reviewed so as to check insect pests during post-harvest operations. In this review article details of heat-treatments using vapour-heat and hot water banana, papaya mango plant are presented. BAP

Apples

- 332 Blankenship (SM) and Sisler (EC). 2, 5-norbornadiene retards apple softening. HortScience 24(2); 1989; 313-314

2,5-NBD, a compound which competes with ethylene for binding sites and inhibits ethylene action in plant tissues, was applied to 'Delicious' apples (*Malus domestica* Borkh.) as a gas in either a closed or flowing system. Apples held in the closed system for 30 days at 25 C in either 2000 or 4000 ul 2,5-NBD/liter were as firm as fruit held equally long at 5 C; apples held in air at 25 C were 19 N softer. Softening appeared to be mediated by ethylene. Soluble solids content and starch loss were similar for fruit held in air or in 2,5-NBD at 25 C. The fruit's internal ethylene concn. showed that 500 or 2500 u 2,5-NBD/liter suppressed, but did not completely inhibit, autocatalytic ethylene production. The preserving effect of 2,5-NBD diminished after 50 days at 25 C. Chemical names used. Bicyclo [2-2-1]-hepta-2,5-diene (2,5-norbornadiene; 2,5-NBD). AS

- 333 Geeson (JD), Smith (SM), Everson (HP), Genge (PM) and Browne (KM). Responses of CA-stored Bramley's seedling and Cox's orange pippin apples to modified atmosphere retail packaging. International Journal of Food Science and Technology 22(6); 1987; 659-668

The responses of Bramley's and Cox's apples to modified atm. (MA) retail packaging were studied in samples of fruit removed from controlled-atm. (CA) storage at monthly intervals through the marketing season, packed in MA or perforated control packs and held under simulated marketing conditions at 15 C. The degree of modification of the pack atm. and the effects of MA packaging on fruit ripening changes were influenced by the duration and conditions of storage prior to packing. In addition, differential effects of MA packaging on the extent of retardation of flesh softening and skin yellowing were found as the storage period was extended. During 2 or 4 wks at 15 C, however, MA packs made from low density polyethylene (LDPE, 30 μ) were effective in retarding changes in firmness and skin colour of Bramleys, previously stored for < 22 wks (October-March) in 8% carbon dioxide + 13% oxygen or for < 30 wks (October-May) in 6% carbon dioxide + 3% oxygen. Similarly, during a 2-wk marketing period at 15 C,

LDPE or ethylenevinylacetate (EVA, 30 u) MA packs were effective in retarding some ripening changes in Cox's previously stored for < 31 wks (October-May) in < 1% carbon dioxide + 1.25% oxygen. The practical benefits of MA retail packaging for the marketing of apples are also discussed. AS

- 334 Knee (M) and Smith (SM). Variation in quality of apple fruits stored after harvest on different dates. *Journal of Horticultural Science* 64(4); 1989; 413-419

The variation in eating quality of 'Cox' apples after harvest at weekly intervals and storage in 2% oxygen was investigated. The sugar and malate content and flesh firmness of the fruit showed larger variations between seasons and between orchards than between harvest dates; much of the variation between harvest dates was lost during storage. The concn. of butanol and butyl acetate after storage increased with later harvest dates but changes in other volatile compounds were small or inconsistent. Sugar, malate and firmness after storage were correlated with the same attributes of the fruit at harvest. Most of the correlations between one attribute and another could be accounted for as a common correlation with harvest date. A taste panel compared stored fruit from various harvest dates with fruit from a single reference harvest. Consistent discriminations were made in one or more sensory attributes for fruit harvested one wk before or after the reference date. In all except one series there were continuous trends of declining acidity and increasing sweetness. Apples usually were judged less firm or tough with later harvests. The taste panel reported an increase in acceptability with harvest date in all series, although the change was sometimes slow. AS

- 335 Quaglia (GB), Lombard (M), Menesatti (P) and Bertone (A). Evaluation of some chemical physical characteristics of a new freeze-dried product composed of apple and milk. *Industrie Alimentari* 27(262); 1988; 1093-1097 (It).
- 336 Thakur (NS) and Lal (BB). Evaluation of plastic carton and corrugated fibre board carton vis-a-vis conventional wooden box for packaging and transportation of apple. *Journal of Food Science and Technology, India* 26(5); 1989; 239-241

In this investigation the evaluation studies on the suitability of plastic carton and corrugated fibre board carton for packaging and transportation of apples as compared to conventional wooden boxes are carried out and results presented. Medium size red delicious apple fruits (70 mm plus or minus) 2.5 dia. from the university orchard located in Solan Dist., Himachal Pradesh were harvested at proper maturity and brought to packing house where they were stored, graded and packed in the four types of packages like telescopic corrugated fibre board carton with trays (A1), telescopic corrugated plastic carton with trays (A2), universal CFB kullu pack (A3) and conventional wooden box (A4) of various inner dimensions. These were transported by truck from Nanni to Delhi market covering about 400 KM distance. The results showed that no damage was observed in the body of apple packed in 3 ply telescopic plastic carton and wooden box, whereas in

tray packed corrugated fibreboard carton some side rubbing and in CFB kulln pack pressing of corners were noticed. It was seen that the quality of fruit retained during transportation in tray packed plastic carton and tray packed CFB carton was statistically at part through superior to the CFB kulln pack and conventional wooden box. NGKR

Bananas

- 337 Mallikarjuna Rao (N). Cysteine protease inhibitors from banana (*Musa paradisiaca*). *Current Science* 58(23); 1989; 1320-1322

Inhibitors of cysteine proteases were found in ripened and unripened banana (*Musa paradisiaca*). Extract from unripened banana inhibited the proteolytic activities of papain, ficin and bromelain. Extract from ripened banana inhibited the proteolytic activities of papain and ficin only. Both ripened and unripened banana extracts inhibited caseinolytic and amidolytic activities of papain. The inhibitory activity of ripened banana extract was stable from extreme acidic pH to neutral pH and unstable at extreme alkaline pH. The inhibitory activity of ripened and unripened banana extracts was stable after heating to 100 C for 10 min. AS

Banana puree

- 338 Richter (ER) and Vore (LA). Antimicrobial activity of banana puree. *Food Microbiology* 6(3); 1989; 179-187

An unidentified substance extracted from concentrated banana puree has been shown to inhibit *Clostridium sporogenes* and other Gram-positive sporeforming bacteria. Water and methanol extracts of concentrated banana puree produced zones of inhibition when tested by well plate biological assay. Organic acids at concn. normally present in banana puree were found not to be solely responsible for the observed inhibition. The unknown substance demonstrated inhibitory effects at pH values as high as 7.5. Heat stability showed that the compound(s) are stable to normal retort temp. AS

Ber

- 339 Sandhu (SS), Thind (SS) and Bal (JS). Effect of pre-harvest spray of ethephon on size, quality and ripening of ber (*Zizyphus mauritiana* Lamk.) cv. Umrani. *Indian Journal of Horticulture* 46(1); 1989; 23-27

The trees of ber (*Zizyphus mauritiana* Lamk.) containing ber fruits were sprayed with ethephon at 0, 200, 400 and 600 p.p.m. levels on February 29 and March 7, 1984. February spray did not increase the fruit and stone size. Breadth, wt. and vol. of the fruits were increased with ethephon treated in March 9. An increase in TSS with corresponding decrease in acidity with all the concn. of ethephon was observed on both the sprays. Among the different concn. of ethephon sprayed on February and March, 400 p.p.m. increased the total and reducing sugar content of the fruits. Ethephon had no effect on starch content. All the ethephon concn. increased the ascorbic acid content over the control. The ripening of the fruits was advanced by

4 to 5 days with all the concn. of ethephon in February spray and the duration of harvesting period was shortened by about 16 days with 400 p.p.m. of ethephon over the control. Ethephon at 200 and 400 p.p.m. sprayed in March also advanced the ripening of fruits by 3 to 5 days and the duration of harvesting period was shortened by 17 days with 400 p.p.m. over the control. KAR

Cider

- 340 Goni (I), Torre (M) and Saura-Calixto (F). Determination of dietary fibre in cider wastes. Comparison of methods. Food Chemistry 33(2); 1989; 151-159

Cider wastes are rich in polysaccharides and can be considered a suitable source of dietary fibre (DF). The measurement of DF as 'non-starch polysaccharides' (48.3% dry matter) and as 'non-starch polysaccharides plus lignin', (63.3%), is performed by spectrophotometric and AOAC procedures. A good agreement between both method for polysaccharide content is found. Correction for condensed tannins (3.1% dry matter) is made. The Klason lignin residue contains protein and condensed tannins. AS

Grapes

- 341 Pesis (E) and Frenkel (C). Acetaldehyde vapours influence postharvest quality of table grapes. HortScience 24(2); 1989; 315-317

'Sultanina' and 'Perlette' grapes (*Vitis vinifera* L.), with initially low sugar concn. (13% to 14% total soluble solids content; TSS) and high acidity received postharvest application of 0.2% to 0.9% acetaldehyde vapours for 24 h. This treatment increased TSS, decreased acidity of the juice, and enhanced the sensory preference by judges in a test panel. However, the response was limited to early picked fruit with low TSS and high acidity and the treatment damaged the berries of 'Sultanina' grapes and left some off-flavour. The levels of acetaldehyde and ethanol in the juice were positively correlated with the amount of applied acetaldehyde, the level of ethanol being 20 times higher than that of acetaldehyde. After 4 days of shelf life, the levels of both acetaldehyde and ethanol declined in the juice. AS

- 342 Reddy (BMC) and Prakash (CS). Effect of grinding and ethrel treatments on berry weight, colour and quality of Gulabi grape. Indian Journal of Horticulture 46(1); 1989; 19-22

The effects of girdling the vine trunk in combination with application of 250 p.p.m. ethrel at various stages of cluster development on the ripening and quality of Gulabi var. of grape were studied. Double girdling 250 p.p.m. ethrel application improved the berry quality and reduced the number of green berries in a bunch to 6.04% as against 11.02% in untreated control. It also hastened the maturity of bunches by about 10 days. Girdling alone increased the total soluble solids in the berries but ethrel showed no effect on total soluble solids. Acidity was not affected by girdling or ethrel treatment
KAR

- 343 Shikhamany (SD) and Narayana Reddy (N). Effect of growth retardants on growth, yield and quality in grape cv. Thompson seedless. Indian Journal of Horticulture 46(1); 1989; 31-38

To prevent the excessive vegetative growth and to increase the productivity vines of Thompson seedless var. of grape were sprayed with 2-chloroethyl trimethyl ammonium chloride (CCC) (1000-3000 p.p.m. levels) and maleic hydrazide (MH) (500-1500 p.p.m. levels) at different leaf stages after pruning. Fruit quality was not influenced by any of the treatments. However 3000 p.p.m. of CCC application at 15 leaf stage was highly effective in increasing the fruit yield/vine. KAR

Guavas

- 344 Pandey (DK), Pathak (RA) and Pathak (RK). Note on the foliar application of nutrients and plant growth regulators in cultivator Sardar guava. II. Effect on ripening of fruits. Indian Journal of Horticulture 46(1); 1989; 28-30

Attempts were made to reduce the ripening period of rainy season guava crop by spraying with urea (2%), potassium sulphate (1%), borax (0.2%) and zinc sulphate (0.4%), either alone or in mutual combination or along with ethrel (250 p.p.m.). First spraying was done before flowering followed by the second and third at fruit setting and 3 wks after fruit setting. Ethrel was applied at the start of the fruit ripening. All treatments advanced ripening; max. earliness in ripening of 10 days was observed with urea + zinc sulphate and the span of ripening period was reduced to a min. of 25 days when this treatment was combined with ethrel. Urea application alone or along with borax advanced ripening by 9 days. KAR

- 345 Weinert (IAG) and van Wyk (PJ). Guava puree with reduced stone cell content. Preparation and characteristics of concentrates and nectars. International Journal of Food Science and Technology 23(5); 1988; 501-510

A decanter centrifuge was used to decrease the content of stone cells in guava puree before evaporation. Conc. factors between 3.3- and 4.3-fold were achieved. Thirty-seven per cent of the stone cells could be removed in a small decanter, whereas virtually all sclereids are removed on an industrial scale. Small significant increases in moisture contents, total soluble solids and titratable acidity and decreases in pectin fractions and ascorbic acid contents (average 38%) occurred during processing; guava colour became darker, redder and less yellow. the apparent viscosity of the puree decreased after centrifugation and increased again during evaporation. Nectars prepared from puree with reduced stone cell content were the most stable. Conc. of puree reduced cloud stability of nectars by up to 34% after 35 days storage, but homogenization improved the stability. Panel members only found significant differences in the colour of nectars prepared from the three conc. AS

Kiwifruits

- 346 Dall'Aglio (G), Gola (S), Leite (DMB), Carpi (G) and Previdi (PM). Preparation and stability of under refrigerated conditions of Kiwifruit pulp, juice and nectar. *Industria Conserve* 64(1); 1989; 32-37 (It).

A pilot plant for processing kiwifruit into pulp and juice in the cold was developed which incorporates a special pulper operating on the halved fruit. Production yields and then physicochemical and microbiological characteristics of the products were determined. Stability tests were conducted on the frozen juice, on the thawed juice during refrigerated storage as well as on a nectar prepared by adding sucrose syrup to the fresh juice and stored in a refrigerated vending machine. AS

- 347 Roudot (AC). Image analysis of kiwifruit slices. *Journal of Food Engineering* 9(2); 1989; 97-118

An objective method for evaluating the appearance of kiwifruit slices is proposed. Three groups of 30 fruits each, subjected to different storage conditions for 24 wks, were examined. Kiwifruit slice images under proper illumination were digitised, then extracted from the background and analysed. Some numerical aspects of the samples were tested and their classification possibilities considered. Fine distinctions were evaluated after modification and standardisation of grey level histograms for the samples. Finally, four quantities were selected to quantify the internal structure of kiwifruit. The results show large differences, in both fine and coarse structure, between fruit stored under normal air and those stored under an atm. of 2% oxygen and 5% carbon dioxide. Samples exposed intermittently to high carbon dioxide levels were similar to those stored in normal air. AS

- 348 Spraggon (SA). Rapid dry matter maturity test for kiwifruit by microwave. *CSIRO Food Research Quarterly* 48(2); 1988; 33-36

This paper describes the use of a microwave oven for the detn. of dry matter content, as a measure of the maturity of kiwifruit. The detn. takes less than one hr, including the simplified preparation of the sample. SRA

Longans

- 349 Wara-Aswapati (O), Srikok (D), Gomolmanee (S) and Boon-Long (P). Effect of Benomyl and sulphur dioxide on storage life of fresh longan. *ASEAN Food Journal* 4(2); 1988; 73-75

Mangoes

- 350 Hemavathi (J), Prabhakar (JV) and Sen (DP). Drying and storage behaviour of mango (*Mangifera indica*) seeds and composition of kernel fat. *ASEAN Food Journal* 4(2); 1989; 59-63

Wide variations were found in the seed content and comp. of

kernel fat of eight commercially important var. of mangoes (*Mangifera indica*). The seed constituted 8.1-22.0% of the fruit, while kernel constituted 45.7-72.8% of the seed on an as-is basis. The fat content in kernels varied from 8.2 -14.3% on a dry wt. basis. The physico-chemical characteristics of the fat were: softening point, 23-34 °C; free fatty acids, 1.3-3.5 g oleic/100 g fat; saponification value, 172-206 mg KOH/g fat; iodine value, Wijs 40.1-56.5 and unsaponifiable matter, 1.0-1.8%. The percentage fatty acid of kernel fat varied as follows; Palmitic, 6.4-15.4; stearic, 25.7-45.3; arachidic, 0.6-2.9; oleic, 40.2-53.5; linoleic, 3.6-9.5 and linolenic 0.2-1.8. Storage of fresh wet seeds of Alphonso (51.2% moisture content) for as long as 16 days under ambient conditions (23 -27 °C, 60-65% RH) resulted in 25.8% kernel spoilage; the free fatty acids of the kernel fat increased from 1.9 to 4.6 g oleic/100 g fat. The fresh wet seeds could be dried to a safer moisture level of 10.8%, by sun-drying for 6 to 7 days or by mechanical drying for 24 h. AS

- 351 Singh (BP), Kalra (SK) and Tandon (DK). Effect of size grading on the storage of mangoes. *Indian Journal of Horticulture* 46(2); 1989; 154-160

'Dashehari' mango was harvested at June end and graded into A, B, C, based on size and wt. A-grade fruits were mostly floaters and C-grade were sinkers while B-grade fruits were in between. After 5 days storage at room temp. ripe fruits were about 38, 57 and 76% in A, B and C- grades, resp. Although, all fruits ripened after 7 days, their marketability declined to 100, 80, 50 in A, B, C- grades, resp. Which has 100% on 5th day in all the grades. Due to the late harvest of fruits, the decay losses were approx. 18, 33 and 36% in A, B and C-grades, resp. after 9 days, but the losses were negligible on 7th day of storage. PLW was lower in A grade fruits. There were not many differences in TSS, acidity or vitamin C but beta-carotene development was much slower in A-grade fruits (2.61 mg/100 g pulp) which may indicate slackened ripening as compared to B and C- grade fruits. Of the three grades, A- grade fruits ripened gradually, had bigger size, better appearance and marketability. AS

- 352 Thomas (P) and Joshi (MR). Reduction of chilling injury in ripe Alphonso mango fruit in cold storage by temperature conditioning. *International Journal of Food Science and Technology* 23(5); 1988; 447-455

The influence of ripening temp. and cold conditioning of climatic fruits on the incidence of chilling injury (CI) in ripe mango fruits Alphonso during refrigerated storage was investigated. Mangoes held and ripened at 20 °C plus or minus 1 °C, RH 85-90% showed little evidence of CI when subsequently stored at 5 or 10 °C up to 14 days. The CI in ripe mangoes was also avoided by holding preclimatic fruits for a period of 30 days at 10 °C and then ripening them at 27-34 °C. The quality of ripe mangoes remained good during cold storage for 7 days and were acceptable until 10-14 days with min changes in texture, flesh colour, carotenoids, soluble solids, titratable acids and ascorbic acid. Shelf-life of ripe mangoes can thus be extended under refrigeration by pre-storage conditioning. SRA

- 353 Wills (RBH), Yuen (MCC), Sabar, Lakshmi (LDS) and Suyanti. Effect of calcium infiltration on delayed ripening of three mango cultivars in Indonesia. *ASEAN Food Journal* 4(2); 1988; 67-68

Muskmelons

- 354 Lester (G). Gamma irradiation, hot water and imazalil treatments on decay organisms and physical quality of stored netted muskmelon fruit. *Journal of Food Safety* 10(1); 1989; 21-30

Gamma rays (2 kilograys) was ineffective in controlling decay and surface molds. Hot water treatment (57 C) coupled with shrink-film wrap was effective in controlling decay activity. Imazalil (1000 p.p.m.) treatment coupled with shrink-film wrap controlled the incidence and severity of decay for 60 days. KMA

Oranges

- 355 El-Zeftaw (BM), Peggie (ID) and Minnis (DC). Postharvest treatments, storage temperature and rootstocks in relation to storage disorders and fruit quality of Valenica oranges. *Journal of Horticultural Science* 64(3); 1989; 373-378

The effect of certain post-harvest chemical treatments, storage temp. and rootstocks on storage disorder and fruit quality of 'Newton Late Valencia' oranges were evaluated. A combination of dip treatments with benomyl 750 p.p.m. GA 500 p.p.m gave highest percentage of sound fruit compared with other combination treatments when stored at 15 C for 18 wks and at 5 C for 9 wks followed by 15 C for 9 wks. Details of combination treatments and storage temp. are presented. BAP

Papayas

- 356 Kumar (M), Mital (BK) and Garg (SK). Effect of papaya pulp addition on the growth of *Lactobacillus acidophilus*. *Journal of Food Safety* 10(1); 1989; 63-73

Effect of papaya pulp addition to skim milk on the growth characteristics of *Lactobacillus* strains was studied. All the strains exhibited higher viable counts, shorter generation time, increased acid production, greater sugar utilization and fall in pH upon addition of papaya pulp. KMA

- 357 Schwab (W), Mahr (C) and Schreier (P). Studies on the enzymic hydrolysis of bound aroma components from *Carica papaya* fruit. *Journal of Agricultural and Food Chemistry* 37(4); 1989; 1009-1012

In this paper the results obtained after simultaneous enzyme catalysis extraction using two different types of hydrolases, beta-glucosidase (emulsin) and acid phosphatase from papaya fruit (*Carica papaya* L.) are presented. This has been carried out by HRGC and HRGC MS identifications of bound volatiles from the above fruit after isolation of an extract obtained by amberlite XAD-2 adsorption and

sol elution followed by simultaneous enzyme catalysis extraction the above enzymes. The results showed aromatic substances such as benzaldehyde benzyl alcohol, 2-phenyl ethanol, and benzyl isothiocyanate as well as (E)-3, 7 - dimethylocta-2, 6-dienoic acid were released by glycosidase whereas the monoterpene alcohols linalool and 3-dimethyloct-7-ene-2,3,6-triol were released by phosphatase activity. Further compounds identified have been discussed. NGKR

- 358 Shetty (KK), Klowden (MJ), Jang (EB) and Kochan (WJ). Individual shrink wrapping. A technique for fruit fly disinfestation in tropical fruits, HortScience 24(2); 1989; 317-319

Papayas (*Carica papaya* L.) that were infested with eggs and first instar larvae of the Oriental fruit fly (*Dacus dorsalis* Hendel) showed a reduction in the number of insects present when the fruits were subsequently wrapped for at least 96 h with plastic shrink-wrap film. In a related study, individually wrapped mangoes (*Mangifera indica* L) that were artificially infested with larvae of *Drosophila melanogaster* no longer harbored living larvae when the wrap remained for 72 h. These studies suggest that further development of individual film wrapping techniques may provide a method for eliminating insect infestation from some edible fruits. AS

- 359 Zee (FT), Nishina (MS), Chan (HT) and Nishijima (KA). Blossom end defects and fruit fly infestation in papayas following hot water quarantine treatment. HortScience 24(2); 1989; 323-325

Viable larvae of the Oriental fruit fly (*Dacus dorsalis* Hendel) were found in *Carica papaya* L. 'Kapoho' fruit after hot water double-dip quarantine treatment in Hawaii. Two types of blossom end defects, navel and definite pinhole, were responsible for the failure of the quarantine treatment. These defects resulted from abnormal placental growth near the blossom end of fruit. Defective fruit also had higher incidences of internal infection by *Cladosporium* sp. and *Fusarium* spp. A survey conducted in the Puna district of the island of Hawaii showed that the incidence of trees bearing defective fruit ranged from 5.3% to 31%. AS

Pears

- 360 Kahlon (PS) and Sandhu (RS). Effect of different treatments and date of harvesting on the cold storage life of Patharnakh pear fruits. Journal of Food Science and Technology, India 26(5); 1989; 290-292

Investigations were conducted to see the effect of chemicals and time of harvesting on the storage behaviour of 'Patharnakh' pear fruits at Amritsar, Punjab. None of the treatments improved all the characters of fruit quality at any stage. Ethephon 300 p.p.m. and higher physiological loss in wt. (PLW) of the fruits over control. While the spoilage losses were minimised with its lower concn. (300 and 400 p.p.m.) ethephon at 400 p.p.m. in stages II and III and its higher concn. (2000 and 3000 p.p.m) gave fruits of good palatability rating. Calcium chloride treated fruits registered less PLW which

were more firm at stage I and with 7.5 % at stage III over control but were of poor sensory quality and failed to effect physical characters including the spoilage of fruits. TSS and sugars, however, increased and acidity levels of fruits decreased during storage irrespective of the treatments. Ethephon at 300 p.p.m. at stage I and 400 p.p.m. at stage II and III proved most beneficial for the cold storage of 'Patharnakh'. AS

- 361 Paola Previdi (M), Vicini (E) and Cassani (A). Spoilage of canned vegetables inoculated with *Yersinia enterocolitica* isolated from cans of peas showing post-process leakage. *Industria Conserve* 64(1); 1989; 3-7 (It).

The ability of three *Yersinia enterocolitica* strains (two isolates from swollen cans of peas and the ATCC 9610 strain) to grow and produce gas in four different canned vegetables was studied as a function of incubation temp. Cans of peas, shell beans, string beans and minestrone soup were incubated at six different temp. (7, 18, 25, 30, 37 and 42 C) following inoculation. The three strains were able to grow in 66.67% of the cans and to swell 69.79% of the spoiled cans as a function of temp. and medium. The gas-producing capacity of the isolates was greater than that of the ATCC 9610 strain. The legumes proved to be suitable media for growth (83.33% of spoiled cans), while the minestrone soup was remarkably less suitable, growth with swelling occurring in 16.67% of the cans only at 7 C. AS

Plums

- 362 Raynal (J) and Moutounet (M). Intervention of phenolic compounds in plum technology. 2. Mechanisms of anthocyanin degradation. *Journal of Agricultural and Food Chemistry* 37(4); 1989; 1051-1053

In this study the simultaneous monitoring of the various constituents during drying of d'Ente plum fruit (*Prunus domestica*, var, d'Ente) was carried out by HPLC. It was found that anthocyanins disappear during initial hours of drying. Glutathion was used to show that anthocyanins can be transformed by a coupled oxidation mechanisms involving quinone formation from chlorogenic acid by polyphenoloxidase. NGKR

- 363 Raynal (J), Moutounet (M) and Souquet (J-M). Intervention of phenolic compounds in plum technology. 1. Changes during drying. *Journal of Agricultural and Food Chemistry* 37(4); 1989; 1046-1050

In this investigation the main simple phenolic compounds in plum fruit likely to have an effect on its quality were studied by HPLC. The formation of these compounds and the enzyme polyphenoloxidase (PPO) was monitored during the first phase of drying under different temp. The polyphenols were extracted separated and identified by HPLC and the enzyme activity was determined. It was found that the d'Ente plum was characteristic in high neochlorogenic acid content and neochlorogenic acid is 2.4 times as high in the epidermis. Rutin is the predominant flavonol glycosides and is found in the epidermis. The degradation of dihydroxy cinnamic acids is directly connected to the

development of PPO activity and its degradation was low at low temp. of drying whereas the flavonoids degradation was high with increasing drying temp. and their reaction to heat treatment was found to be quite different. NGKR

Strawberries

- 364 Li (C) and Kader (AA). Residual effects of controlled atmospheres on postharvest physiology and quality of strawberries. *Journal of the American Society for Horticultural Science* 114(4); 1989; 629-634

Results from this research demonstrate the residual effects of controlled atm. (CA) on post-harvest physiology and quality of strawberries. These residual effects may include the reduction of respiration and ethylene production rates, accumulation of ethanol and possibly other volatiles, maintenance of flesh firmness and retardation of flesh colour development. Exposure of strawberries to controlled anhydrospheres of varying concn. of carbon dioxide and oxygen and the resulting effects of exposures to such concn. are described in detail. BAP

CONFECTIONERY, STARCH AND SUGAR

Confectionery

Chocolates

- 365 Pagani (M) and Quadri (G). Filth-tests carried out on high fat level and chocolate products. *Industrie Alimentari* 28(270); 1989; 389-391 (It).

Cocoa

- 366 Schmid (H) and Chiappa (O). Cocoa roasting, from rib to liquer. *Industrie Alimentari* 28(270); 1989; 378-384 (It).

Sugar

- 367 Londhe (MB), Jadhav (SY) and Zende (AA). A new approach to measure colour in white sugar manufacture. *Indian Sugar* 39(9); 1989; 675-681

Development of colour during white sugar manufacture is determined by ICUMSA method. Although the colour removal during juice clarification can be found out by conventional method during pan boiling operation colour development measured by conventional method is not found suitable. A new method based on colour x solid product has been tried in two factories for judging colour removal or colour development operations, which shows that the method is more precise than the conventional method. Authors termed the unit as a tonnes ICUMSA unit. The new method could be used to judge colour development during A massecuite boiling, B massecuite boiling, C massecuite boiling, crystallisation and centrifugal operation. KAR

Jaggery

- 368 Anon. Revolution in jaggery manufacture. Indian Sugar 39(8); 1989; 611-614

Preparation of jaggery in sugar factories has several advantages including the higher extraction of juice. The experience of Jaknur factory in Karnataka (India) in the preparation of jaggery has been illustrated as an example for this. KAR

Sugarcane juices

- 369 Beniwal (MS), Satyavir and Taneja (AD). Effect of red rot on juice quality of sugarcane. Indian Sugar 39(6); 1989; 403-406

Sugarcane red rot disease caused by *Colletotrichum* has great influence on the juice quality. It reduced the brix (7.03-32.94%), pol % (7.43-38.70) and commercial cane sugar (7.84-43.31%), while the reducing sugars increased (19.23-409-452%), depending upon the extent of resistance of the var. to the diseases. In resistant clones like CO. 7314 the adverse effect on juice quality was least, while it was max. in highly susceptible clones like Co. L. 29 and S. 78/560. KAR

- 370 Sreenivas (K), Mastan Reddy (C), Sreenivasa Reddy (K) and Yallamananda Reddy (T). Influence of nutrient status of leaves on cane yield and juice quality of sugarcane. Indian Sugar 39(9); 1989; 693-697

The study on the influence of nutrient status of leaves on cane yield and quality in three var. of sugarcane (Co 62175, CoT 8201 and Co 7219) showed that the leaf N and sheath K contents were positively correlated with cane yield and negatively with juice sucrose at grand growth and maturity phases. The sheath P content was negatively correlated with cane yield and positively with sucrose at maturity phase. The final sugar yield at harvest was positively correlated with leaf 'N' content at formative and grand growth phases and sheath 'K' at grand growth and maturity phases. The sheath 'P' at maturity was negatively correlated with sugar yield. KAR

BAKERY PRODUCTS

Bread

- 371 Bera (MB) and Mukherjee (RK). Preparation of rice bran protein concentrate and its use in bread. Indian Journal of Nutrition and Dietetics 26(2); 1989; 48-55

The full fat and defatted rice bran contain about 15 and 20% protein resp. besides containing valuable minerals. This investigation was undertaken to study the protein extraction from rice bran and evaluate its baking quality for use in bread. Kaviraj-Sail var. of raw paddy was milled and bran obtained by giving about 6% polish to the rice, sieved using 20 mesh sieve and bran was defatted by hexane.

Protein conc. were prepared using defatted rice bran. The baking quality was tested by supplementing maida with protein conc. from rice bran at 5 to 15% levels. The bread prepared from this was evaluated for texture, colour of crumb, colour, and nature of crust, grain, aroma, taste and overall acceptability on a 20 point scale. It was seen that the pH of extraction medium affected the protein conc. yield more than time and temp. of extraction. Protein conc. yield was max (39.61%) at pH 10.5, temp. 60-80 C and 60-120 min. Protein conc. up to 5% could be blended with wheat flour for breadmaking without affecting the baking characteristics. NGKR

- 372 Hellemann (U), Tuorila (H), Salovaara (H) and Tarkkonen (L). Sensory profiling and multidimensional scaling of selected Finnish rye breads. *International Journal of Food Science and Technology* 22(6); 1987; 693-700

A vocabulary for the description of the sensory properties of Finnish rye breads was developed as a basis for the design of a practical quality control product development system to be used in a later study. Six samples, selected from thirty-two commercial rye breads, were evaluated for the intensity of twenty-nine attributes and for similarity between sample pairs. Significant differences were found between samples in the intensity of twenty-eight of these descriptors. The data were combined by a multidimensional scaling procedure (KYST 2A and PROFIT), which revealed three discriminative dimensions among the samples: (1) from pleasant rye-like to unpleasant flour-like; (2) from sweet to bitter; and (3) the presence/absence of a characteristic flavour caused by specific baking conditions (low temp., long baking time). The PROFIT procedure identified 20 attributes as important for quality of rye bread samples using multiple correlation coeff. There were five appearance attributes, two odour attributes, six taste attributes, five texture attributes and overall impression of pleasantness and freshness. AS

- 373 Salovaara (H) and Valjakka (T). The effect of fermentation temperature, flour type, and starter on the properties of sour wheat bread. *International Journal of Food Science and Technology* 22(6); 1987; 591-597

The effects of the type of wheat flour (white or dark), fermentation temp. (25 C or 30 C) and origin of starter (bakery A compared with bakery B) on acid production and bread properties were examined in a factorial design. The type of flour was the most important factor; with dark flour (ash content 1.64%) the acetic acid concn. in the bread was almost double that from white flour (ash content 0.86%); lactic acid was 30 to 50% higher. Acid production increased as fermentation temp. increased to 30 C, but was not influenced by the origin of the starter. Loaf specific vol. decreased with acid concn., but souring lengthened the mould-free time from 4 days to 5 to 8 days or more as acidity increased. Sour wheat bread had a characteristic taste. Those with higher acidity values were more bitter and pungent. Rye sour and rye sour bread production technology could also be utilized in white breadmaking. AS

Pasta

- 374 Littmann-Nienstedt (S). Evaluating a ring test to determine lactic acid and 3-hydroxy-butyric acid in pasta and refined pastry made from biscuit dough. Deutsche Lebensmittel-Rundschau 85(6); 1989; 183-184 (De)..

10 laboratories join in a ring test to investigate into a gas chromatographical working method to determine lactic and 3-hydroxy-butyric acid in egg noodles and biscuit. Statistical evaluation resulted in very favourable values with regard to reproducibility, comparability and finding back of acid quantities. The method is proposed for inclusion in the method collection according to art. 35 of the German Food Law (LMBG), and is published in December 1988. AS

- 375 Skurray (GR), Young (D) and Nguyen (M). Rice bran as a source of dietary fibre in pasta. ASEAN Food Journal 4(2); 1988; 69-70

MILK AND DAIRY PRODUCTS

- 376 Barraquio (VL) and van de Voort (FR). Milk and soy proteins. Their status in review. Canadian Institute of Food Science and Technology Journal 21(5); 1988; 477-493

The dairy industry has been competing with the soybean industry for many yrs on two fronts, namely, lipids and proteins. The margarine-butter struggle is essentially over, however, the protein battle is just beginning to develop. The markedly lower price of soy and the research effort which is going into soy protein to make it even more acceptable to formulators should be of the utmost concern to the dairy industry. In this review paper, the manufacture, physico-chemical, functional, and nutritional properties of milk and soybean proteins are summarized and compared. Milk proteins have good nutritional value, functional properties and a wholesome image which make them somewhat more attractive to the food industry over the comparative newcomer, soy protein. Further research based on newer technologies such as extrusion processing and the use of milk protein/soy blends may alleviate some of the cost problems associated with milk proteins and increase the overall consumption and utilization of both proteins. AS

Milk

- 377 Balasubramanyam (BV) and Puranik (DB). Aseptic packaging of milk. Indian Dairyman 41(12); 1989; 639-642

In India with the introduction of UHT processing of milk aseptic packaging is fast increasing. Some of the commercial systems available like, tetrabrick, combi bloc, Doypack, and bag-in-box are reviewed briefly. KAR

- 378 Bardhan (PC). Operation flood—Its evolution, the strategy followed and progress achieved. Indian Dairyman 41(12); 1989; 609-623

An exhaustive review of the topic covering such aspects like evolution of operation flood, strategies adopted, development as an institution, application of various technologies, for integrated development, the impact of operation flood system on the milk supply, farmer participation, marketing strategies adopted and its impact on income of farmers and achievement of self sufficiency in milk and milk products. KAR

- 379 Khedkar (CD), Mantri (JM) and Kulkarni (SA). Therapeutic properties of acidophilus milk. Indian Dairyman 41(11); 1989; 562-565

Acidophilous milk which contains *Lactobacillus acidophilus* is becoming more popular and many qualities have been attributed to this milk. Of the therapeutic properties, the scientific literature published show that it possesses antimicrobial activity, and is useful in treatment of gastrointestinal disorders, in constipation, as anticancer agent and in controlling body cholesterol level. KAR

- 380 Prasad (C), Prasad (S) and Singh (MD). Physico-chemical changes in evaporated milk during manufacture and storage. Indian Dairyman 41(10); 1989; 505-508, 553

Physical and chemical changes during manufacture and storage of evaporated/concentrated milk lead to problems like change in colour; pH; Viscosity; flavour; fat separation; sedimentation and sensory characteristics. Author reviews various suggestions made by experts to overcome these problems and suggests for the adoption of right type of processing and storage. KAR

- 381 Sharma (T) and Mathur (BN). Appraisal of thermal processing conditions for pasteurisation of milk. Indian Dairyman 41(12); 1989; 633-637

Out breaks of Listeriosis disease by consuming pasteurised milk has become a great concern regarding the effectiveness of pasteurisation. Authors dwell on the effect of pasteurisation especially at different temp. on pathogenic organisms, keeping quality of milk, processability of pasteurized milk and the effect on organoleptic properties, effect of high pasteurisation temp. on nutritive value and xanthine oxidase; and technology economic feasibility of raising the pasteurisation temp. KAR

- 382 Singh (RB), Rakesh Babu Mishra (AK). A glance at operation flood phase I, II and III. Indian Dairyman 41(11); 1989; 558-560

Gives an overall view of the Operation Flood Programme which is directed towards the development of dairy industry in India, involving setting up of rural milk producers co-operative organisations to procure, process and market milk. How the Operation Flood I, II and III have contributed for the development of dairy industry in India and for increasing the milk supply have been described. KAR

- 383 Tikku (D). Innovation in milk distribution. *Indian Dairyman* 41(12); 1989; 625-630

The author recollects the traditional milk distribution system in India and describes how the seasonal variation in production and consumption, variation in fat content, climate, transportation, and others influence the milk distribution system. The operation system of the Delhi mother dairy has been described as an example for adoption of some innovative system. KAR

- 384 Yadav (JS), Sunita Grover Batish (VK). Role of marketing and related factors in the microbiological quality of milk and milk products. *Indian Dairyman* 41(10); 1989; 527-534

Methods of marketing milk and milk products, factors affecting the microbiological quality during marketing, like the effect of mode of packaging and distribution, temp. and time of holding, marketing environment and marketing personnel have been reviewed. The milk products described are fluid milk in small and bulk vending, khoa and khoa based sweets, paneer and chhanna, cream, butter and ghee, conc. and dried milks, frozen dairy products and fermented milk. KAR

- 385 Yesim Ozbas (Z) and Temiz (A). Comparison of methods for enumeration of *Escherichia coli* in raw milk samples. *Journal of Food Science and Technology, India* 26(5); 1989; 248-251

In this study the different methods viz. the most probable number (MPN) method of AOAC modified direct plate method (MDP), violet red bile agar/violet red bile agar (VRBA/VRBA) and modified MPN (MMPN) for the enumeration of *Escherichia coli* in naturally contaminated raw milk were compared. The statistical analysis of data showed no significant difference among the counts obtained by these methods. NGKR

Milk products

Cheese

- 386 Champagne (CP) and Goulet (J). Growth of bakers' yeast (*Saccharomyces cerevisiae*) in lactose hydrolyzed cheese whey ultrafiltrate. *Canadian Institute of Food Science and Technology Journal* 21(5); 1988; 545-548

A bakers' yeast strain (VVR-215), resistant to catabolite repression, was used for biomass production on lactose-hydrolyzed whey ultrafiltrate. Glucose was initially metabolized, followed by galactose without any lag phase. Ethanol accumulated during growth on glucose even under aerated conditions. Ethanol, which was produced from glucose but not from galactose, was assimilated after depletion of galactose. Utilization of glucose and galactose by yeast cells reduced the potential for product inhibition of beta-galactosidase, and permitted hydrolysis of residual lactose. Supplementation with ammonium sulphate and corn steep liquor increased biomass yields, corn steep liquor being the most effective. AS

- 387 Esteban (MA) and Marcos (A). Chemical prediction of water activity in processed cheese. *Journal of Dairy Research* 56(4); 1989; 665-668

By linear regression analysis, a highly significant negative correlation ($r = -0.96$) was found between the mean ash concn. values (g/100 g moisture) and water activity of six types of processed cheese (low-fat, semi-fat, extra-fat, double fat and special). The regression equation water activity = $0.9951 - 0.0032 (\text{ash})$, applied to 40 cheese samples, yielded water activity values which differed by < 0.005 water activity units from those measured experimentally in 75% of the samples. The max. differences between the calculated and experimented water activity values (found in only two samples) were plus or minus 0.01 water activity units. AS

- 388 Zuber (F), Megard (D) and Cheftel (JC). Continuous emulsification and gelation of dairy ingredients by HTST extrusion cooking. Production of processed cheeses. *International Journal of Food Science and Technology* 22(6); 1987; 607-626

Processed cheese was prepared batchwise and by extrusion cooking. The Cheddar based cheese mix contained varying amounts of polyphosphate ions, rework, lipids, water and/or non cheese proteins. The extrusion conditions (barrel temp., screw speed and screw profile) were also varied. The texture, structure and colour characteristics of batch and extrusion-processed cheeses were evaluated using penetrometry, scanning electron microscopy and reflectance measurements. The degree of fat emulsification was assessed and the proportion of casein nitrogen sedimentable by ultracentrifugation was determined, as a means of following micellar disruption plus casein restructuring due to extrusion and to the additional creaming step. Results indicate that extrusion cooking can be used to continuously mix, melt, emulsify and gel the cheese mix constituents, and that processed cheeses or cheese analogues of varying texture (spreadable to sliceable) can be obtained, with a mean residence time in the extruder of about 100 sec. AS

Cheddar cheese

- 389 Bines (VE), Young (P) and Law (BA). Comparison of Cheddar cheese made with a recombinant calf chymosin and with standard calf rennet. *Journal of Dairy Research* 56(4); 1989; 657-664

The cheesemaking properties of recombinant chymosin from *Kluyveromyces lactis* (Gist-Brocades Chymosin 610) were compared with those of standard rennet in parallel trials with the same milk and mixed culture starter. For each pair of cheeses the cheesemaking characteristics, mass balance results, comp. of the cheeses at 6 wks and maturation rates were similar. A taste panel was not able to differentiate between the cheeses at 3, 6 or 12 months. AS

- 390 Vijayender Rao (D). Manufacture of UF Cheddar cheese-developments and challenges. *Indian Dairyman* 41(12); 1989; 657-660

Ultrafiltration (UF) offers as a practical method of disposal of

whey and increasing the cheese yield at the same time. The process of UF operation, effect of UF on milk constituents, different methods of increasing cheese yield by UF process, and the changes taking place during the manufacture of Cheddar cheese from UF concentrated milk have been reviewed. 18 references. KAR

Dahi

- 391 Ghandhi (DN) and Muralidhara Rao (S). Dahi and acidophilus milk. Indian Dairyman 41(10); 1989; 521-525

Dahi (Indian fermented milk) and acidophilus milk are compared. Aspects covered include types of dahi and acidophilus milk products produced in India; properties and comp. of dahi and acidophilus milk, possibilities of improving them, therapeutic value, techniques of their preparation and general consumer acceptance of the products. KAR

Ghee

- 392 Ghatak (PK) and Bandyopadhyay (AK). Chemical and sensory quality of ghee marketed in Calcutta and Kalyani (West Bengal). Indian Dairyman 41(10); 1989; 515-518

47 ghee samples manufactured by organized and unorganized dairies of Calcutta and Kalyani (India) were analysed for moisture, Reichert-Meissel value, Polenske value, free fatty acid, iodine value, peroxide value and butyro-refractometer reading at 40 C. Flavour, colour and texture of ghee from organized dairies were superior to that from unorganised dairies. Moisture and free fatty acid content and peroxide value in ghee from unorganized dairies were much higher than the ghee from organized dairies. Ghee from organised dairies had much higher saponification values than the ghee from unorganized dairies. None of the ghee collected was adulterated with animal body fat. Vanaspathi (hydrogenated fat) was detected in 11 ghee samples produced from unorganized dairies. KAR

Paneer

- 393 Dharam Pal and Garg (FC). Studies on utilization of sweet cream buttermilk in the manufacture of paneer. Journal of Food Science and Technology, India 26(5); 1989; 259-264

In this paper the effect of additives like sweet cream buttermilk on the quality aspects of paneer has been studied and results presented. Paneer was prepared from Buffalo milk which was standardised to 5.9% fat by adding buttermilk. The quality of this buttermilk extended paneer (BEP) was compared to conventional paneer (CP). It was seen that addition of buttermilk significantly increased the moisture retention capacity of BEP and also increased the yield by about 1% over CP. It was found possible to improve the texture of CP made at 80 C which was dry and hard by mixing buttermilk solids. It was also seen by adopting coagulation temp. of milk at 70 C the recovery of total solids was significantly higher in BEP as compared to CP; the

keeping quality of both types of paneer remaining same. Good quality paneer resulted by using low fat milk(5.1%) by mixing about 30% buttermilk to buffalo milk. NGKR

Yoghurts

- 394 Kneifel (W), Holub (S) and Wirthmann (M). Monitoring of B-complex vitamins in yoghurt during fermentation. International Bottler and Packer 56(4); 1989; 651-656

Eight commercially available yoghurt starter cultures were examined for their ability to synthesize water-soluble vitamins. In order to yield comparable assaying conditions, 12.5% reconstituted whole milk was used for yoghurt production throughout the exp. When applying the traditional method for yoghurt manufacture (short-time incubating at 42 C/3-4 h) with all cultures the following vitamins were enriched during fermentation by more than 20% thiamin (two cultures), pyridoxine (four cultures), folic acid (one culture), and biotin (two cultures). Two starter cultures were selected and used to compare vitamin profiles during the two different methods of fermentation. In contrast to short-time incubation, long-time yoghurt production (30 C/14-16 h) led to a lesser production of folic acid, but to increased concn. of thiamin and of nicotinic acid. AS

Milk proteins

Casein

- 395 Bhadanla (AG) and Shah (US). Drying of industrial casein-a review. Indian Dairyman 41(11); 1989; 566-569

Casein drying at industrial level is influenced by air temp., air velocity, air humidity, wet casein characteristics, casein particle size and extent of loading of trays. The paper reviews aspects like drying behaviour of casein, methods of casein drying, drying with tray driers, and fluidized bed driers. New approaches to casein drying techniques and energy requirement for drying are the other aspects covered. KAR

- 396 Gupta (VK). Technology of edible casein. Indian Dairyman 41(12); 1989; 643-650

Surplus milk available in Indian dairy plants, particularly during flush season, can be used for edible casein manufacture. Standards for edible casein manufacturing processes including separation, pasteurisation, casein precipitation, quality of acid, precipitation temp., whey drainage, curd washing, pressing or dewatering, milling and drying, grinding, sieving and bagging are given. Edible casein from buffalo milk and continuous manufacture of edible casein are the other aspects covered. KAR

- 397 Martine Le Meste and Duckworth (RB). Effect of water content on the mobility of solute molecules and of protein side chains in caseinate preparations. International Journal of Food Science and Technology

23(5); 1989; 457-466

The effect of water content on the mobility of small solute mol. and of casein side chains was studied by electron spin resonance in caseinate/water systems. The immobilization of nitroxide probes of different sizes and properties were followed during progressive dehydration of concentrated caseinate preparations (3 g water/g dry protein). Above a characteristic min moisture content a linear relationship was observed between the rotational diffusivity and water content. The slope of the straight lines depended upon the size of the probe and upon the nature of the interactions with the protein. Nitroxide labels were covalently bound to caseinate and the changes in the flexibility of the side chains as hydration changed were followed. The results are discussed in relation to the solvent properties of water, and to recent suggestions concerning the significance, for stability, of the glass transition phenomenon in such materials. AS

- 398 Sienkiewicz (T), Hohamed (SHT) and Lipke (B). Group separation of caseins from cow milk on hydroxy-apatite. *Nahrung* 32(8); 1988; 749-753 (De).

Ion exchange-chromatography method with the use of hydroxyapatite is considered one of the methods used for the casein fractionation particularly those containing phosphate in its comp. Simplicity of hydroxyapatite preparation and its easily use in casein fractionation in batches are advantages of this method. Sephadex G-25 or Agarose is used to ease the sample passage through the column. By using of hydroxyapatite in batches, α_s -casein can easily be separated with the use of buffer solution 0.006 M phosphate at pH 6.6 and the elution is carried out by buffer solution containing 0.25 M potassium dihydrogen phosphate, 0.2 M KCl, 4.5 M urea and 0.002 M di-thiotreitol. Before the elution of α_s -casein, beta- and x-casein are separated using buffer solutions containing 0.005 M and 0.1 M potassium dihydrogen phosphate in addition to the previously mentioned components. AS

MEAT AND POULTRY

Meat

- 399 Akgul (A) and Kivanc (M). Growth of *Staphylococcus aureus* in kofte, a Turkish ground meat product, containing laser Trilobium spice. *Journal of Food Safety* 10(1); 1989; 11-19

The influence of Laser trilobum spice on the growth of *Staphylococcus aureus* was examined in a Turkish ground meat product. Spice reduced *Staphylococcus aureus* count under most conditions. The growth varied with holding temp, spice levels, inoculation and beef samples. KMA

- 400 Mahajan (P) and Panda (PC). Effect of post exsanguination electrical stimulation on meat quality. A review. *Indian Food Industry* 8(3);

1989; 1-9

Electrical stimulation of pre-rigor muscle as a means to increase tenderness and accelerate the hot processing is receiving renewed attention these days while exploiting the process commercially. Research carried out on effect of electrical stimulation on rate of postmortem glycolysis, tenderness, carcass quality and palatability attributes of meat have been reviewed in brief, indicating the future thrust needed in the area. AS

- 401 Mekhael (KG), Bassily (NS), EL-Shafei (MM) and Said (AK). Nutritive value of meat-soy mixture. *Nahrung* 32(8); 1988; 729-735

The protein value of meat-soy blend was evaluated by utilizing the net protein ratio (NPR), the relative protein value (RPV) and the serum urea content methods. It was compared with that of meat. Casein was used as a reference protein. NPR values indicated that utilization of meat and meat-soy proteins are comparable. The study of amino acid pattern shows that sulphur containing amino acids are limiting to almost the same degree in meat and meat-soy blend. However, the RPV of meat soy bean blend is slightly higher than that of meat. The lowest serum urea content was that of rats fed meat-soy blend. Therefore, the mixing of the meat with soybean did not reduce the nutritive value of meat, on the contrary there is tendency towards improvement. AS

- 402 Morley (MJ) and Fursey (GAJ). The apparent specific heat and enthalpy of fatty tissue during cooling. *International Journal of Food Science and Technology* 23(5); 1988; 467-477

As there is a lack of data on solidifying animal fats under thermal conditions akin to those existing during commercial chilling and freezing processes, the apparent specific heats and enthalpies of pork, beef and lamb adipose tissues in the temp. range 40 to -40 C were determined dynamically during cooling at linear rates by differential scanning calorimetry. The temp. variation of specific heat and overall enthalpy change measured during cooling were found to differ from similar measurements made during subsequent heating. For the cooling rates used (0.312, 0.625 and 1.25 C/min.) the rate of cooling had only a minor effect on specific heat. The freezing of tissue water showed high degrees of supercooling. AS

Beef

- 403 Bhattacharya (M) and Hanna (MA). Kinetics of drip loss; cooking loss and colour degradation in frozen ground beef during storage. *Journal of Food Engineering* 9(2); 1989; 83-96

The objective of this study is to determine the kinetics of drip loss, cooking loss and colour degradation as affected by fat content, type of packaging, storage time and storage temp. It is found that the rate of quality degradation of ground beef patties in terms of drip loss, cooking loss and colour followed first-order relationships. The rate constants were affected by both package type and fat content.

The 30% fat patties showed greater drip, cooking losses and colour changes. Patties packaged in polyethylene had greater drip and cooking losses but less colour change. The effect of storage temp. on the rate constants was insignificant. SRA

- 404 Burroot (D) and Griffin (WJ). Effect of dimensions on the heating times and weight losses of cylindrical beef joints. *International Journal of Food Science and Technology* 23(5); 1988; 487-494

Experimental tests showed that cooking loss was not affected by the diameter of a lean joint but decreased very slightly with length. A 7 mm layer of fat cover did not affect cooking losses from the lean meat. Cooking wt. loss was not affected by joint diameter but decreased very slightly with length. Heating time to 74 C increased with joint length and asymptotically approached the heating time for an infinitely long cylinder. The variation of heating time with joint diameter and length was predicated using mathematical model. SRA

- 405 Fox (DG), Perry (T), Eckerlin (RH), Appel (LD), Lisk (DJ), Manzell (KL) and Kenny (KP). Brewer's grains as a source of selenium in beef cattle rations. *Journal of Food Safety* 10(1); 1989; 43-47

Barley grown on high Se soils serve as an efficient supplementary source of Se in cattle rations. The Se content in the blood of cattles fed with this barley was 12-15 µg/100 ml as against 0.01 µg/100 ml in control animals. KMA

- 406 Gigiel (AJ), Collett (P) and James (SJ). Fast and slow beef chilling in a commercial chiller and the effect of operational factors on weight loss. *International Journal of Refrigeration* 12(6); 1989; 338-349

Slow beef chilling to avoid cold shortening (trial 1) was compared with rapid chilling to achieve a quick turnover and low wt. loss (trial 2) in a commercial chiller designed to operate under either specification. Both specifications achieved their main aims. In trial 1 no part of the loin fell below 10 C within 10 h postmortem. Deep leg temp. were between 14.5 and 21 C at 24 h postmortem compared with 9.5-14.8 C in trial 2. The percentage wt. loss from fully chilled sides was predicted to be 0.84% less in trial 2 than trial 1. Operational factors, such as the time between death and hot wt., were found to have at least as important an effect on wt. loss as the technical specification of the chiller. AS

Mutton

- 407 Prasad (VSS). Defference in mutton and chevon quality due to the cooking method. *Indian Journal of Animal Sciences* 59(11); 1989; 1437-1443

The differences between sheep and goat rib roasts (9-12 ribs) and the longissimus dorsi muscle obtained from 8-11 kg carcasses and cooked by different methods were investigated in 3 exp. Cooked goat rib roasts had more lean, less fat and more bones than sheep rib roasts. Significant species x cooking method interaction was observed

for cooked meat characteristics. Among moist heat cooking methods, stewing suited the mutton better and pressure cooking caused toughness. For chevon, pressure cooking resulted in better lean retention and water-holding capacity. Dry heat cooking methods like broiling and roasting caused less than retention and higher cooking losses in chevon than mutton. AS

Sheep

- 408 Mahendrakar (NS), Dani (NP), Ramesh (BS) and Amla (BL). Effect of post-mortem chilling and sheep carcass conditioning on extractability and fractions of muscle proteins. *Journal of Food Science and Technology*, India 26(5); 1989; 265-268

Eleven Bannur ewes (age: 4-5 yr, live wt. 22.30 plus or minus 2.0 kg) were sacrificed and carcasses slit vertically into two halves. The half-carcasses were subjected to either (i) achilles tendon suspension at 2-3 °C for 24 h (direct chilling C_1), (ii) Pelvic suspension at 26 plus or minus 2 °C for 7 h (7 h, RT), (iii) pelvic suspension at 26 plus or minus 2 °C for 7 h followed by chilling at 2-3 °C for 17h (delayed chilling, C_2) or (iv) left untreated (fresh, F). Semi-membranosus and semi-tendinosus (thigin) muscles of F-, 7 h RT-, C_1 and C_2 -carcasses as well as neck muscle held at 2-3 °C were used for the study. The results revealed that during post-mortem chilling the extractability of muscle proteins in buffer of ionic strength $\mu = 0.55$ decreased initially upto 6 h followed by slight increase at 25 h postmortem and these changes were primarily due to changes in myofibrillar fraction. Contraction/stretching of muscles due to carcass conditioning treatments had 3 marginal ($P < 0.05$) effect on extractability in buffer of high ionic strength ($\mu = 0.55$) as well as in alkali, whereas extraction in buffer of low ionic strength ($\mu = 0.05$) was significantly ($P < 0.05$) lower in 7 h RT and C_2 muscles due to partial denaturation of sarcoplasmic proteins. AS

Pork

- 409 Swatland (HJ). Selection of wavelengths at which to measure paleness in pork by fiber-optic spectrophotometry. *Canadian Institute of Food Science and Technology Journal* 21(5); 1988; 494-500

Products

Bacon

- 410 Fiddler (W), Pensabene (JW), Foster (JM) and GatesRA). N-nitrosothiazolidine and N-nitrosothiazolidine 4-carboxylic acid in dry cured bacon. *Journal of Food Safety* 9(4); 1989; 225-233

N-nitrosamines in dry cured bacon were determined. The N-nitrosothiazolidine content ranged from none detected to 22.3 p.p.b.; N-nitrosothiazolidine-4-carboxylic acid ranged from 7 to 6478 p.p.b. It was also evident that the processing conditions may favour the formation of N-nitrosothiazolidine-4-carboxylic acid. KMA

Bologna

- 411 Swatland (HJ). A brief study of the effect of nitrite on bologna colouration measured with a colormet fiber-optic spectrophotometer. Canadian Institute of Food Science and Technology Journal 21(5); 1988; 560-562

A commercially available portable spectrophotometer with a fiber-optic probe and a photodiode-array (Colormet meat probe) was used to measure the reflectance spectra of bologna manufactured with and without added nitrite. The addition of nitrite was associated with lower ($P < 0.01$) reflectance at 400 and 410 nm, and with higher reflectance at 430 and 440 nm and from 600 to 700 nm. Similar results were obtained independently with an optical bench spectrophotometer. An isobestic point at 580 nm might be used to measure nitrite-related redness with a ratio, 670/580 nm. AS

Poultry

Chickens

- 412 Anand (SK), Pandey (NK), Mahapatra (CM) and Verma (SS). Effect of storage on microbial quality of dressed chicken held at -18°C . Journal of Food Science and Technology, India 26(5); 1989; 296-297

The effect of storage on microbial quality of dressed chicken held at -18°C was studied. Eviscerated, whole broiler carcasses were aged at 5°C for 4.8 and 24 h and then frozen stored at -18°C . Microbiological examination was carried out at monthly intervals for 6 months. It was seen that the ageing process carried out prior to freezing resulted in an increase in the microbial load on the carcasses. But during frozen storage a gradual decrease was noticed in different microbial counts. The chicken carcasses were found to be acceptable after 6 months of frozen storage and no *Salmonella* was isolated from any of the samples. NGKR

- 413 Harrison (MA) and Carpenter (SL). Survival of *Listeria monocytogenes* on microwave cooked poultry. Food Microbiology 6(3); 1989; 153-157

The survival of *Listeria monocytogenes* on poultry processed in a microwave oven was assessed. Chicken breasts were inoculated with approx. 10^5 - 10^7 *L. monocytogenes* Scott A/g, cooked to one of five different internal temp. vacuum packaged or wrapped in an oxygen permeable film and stored for up to 4 wks at 4°C or 10 days at 10°C . Although each heat treatment used decreased the *Listeria* population, survivors were encountered at each cooking temp. At higher temp. (73.9 , 76.7 and 82.2°C), the population was initially reduced 2.5-3.8 logs, whereas the lower cooking temp. (65.6 and 71.7°C) resulted in a less than 2-log cycle reduction. The *L. monocytogenes* population in samples stored at 4°C was approx. the same or slightly greater than the post-processing level after 4 wks. In samples stored at 10°C , the microbial population was re-established within 10 days to levels at least as great as that initially inoculated onto the chicken breasts. Differences due to packaging were observed at both storage

temp. AS

- 414 Schnepf (M) and Barbeau (W). Survival of *Salmonella typhimurium* in roasting chickens cooked in a microwave, conventional microwave and a conventional electric oven. *Journal of Food Safety* 9(4); 1989; 245-252

Fresh whole roasting chickens were inoculated with *Salmonella typhimurium* and cooked on a microwave, convection microwave, or conventional electric oven to 74 to 85 C. It was observed that the chicken cooked at 79 and 85 C in microwave showed positive for *Salmonella*. KMA

- 415 Smolinska (T), Kopec (W) and Trziszka (T). Effect of skin addition on the technological properties of comminuted chicken meal emulsion. *International Journal of Food Science and Technology* 23(5); 1988; 441-446

The functional and rheological properties of meat emulsions made from broiler chicken breast meat, with addition of leg meat or of skin as the binding agent have been compared with those made from the individual muscles. Results indicate that 5% skin added to the comminuted breast muscles resulted in the collagen content equal to that obtained with 40% leg muscles. Addition of 5% skin to the breast muscles decreases emulsifying capacity of protein extracts but increases thermal stability, and changes the flow curve and meat more than the addition of dark muscles. No changes in binding and sensory properties of skin supplemented sausages was noticed, but reduction in water holding capacity and palatability was observed. SRA

Turkeys

- 416 Richardson (RI) and Jones (JM). The effects of salt concentration and pH upon water-binding, water-holding and protein extractability of turkey meat. *International Journal of Food Science and Technology* 22(6); 1987; 683-692

The effects of salt concn. and pH upon protein extractability and water-binding by homogenates of turkeys breast, thigh and drumstick meat, and also the effect of salt concn. and centrifugal force upon water-binding of raw meat and water-holding of cooked meat from breast and thigh were studied. Concn. of sodium chloride above 0.3 M caused swelling of meat homogenates. With the pH values adjusted to 6.0 and with sodium chloride concn. greater than 0.6 M, breast meat was able to swell more than leg meat. Water-binding increased with increasing pH value. Breast meat homogenates had more extractable protein than leg meat homogenates and protein extraction was increased by increasing both salt concn. and pH. Cooked breast meat retained more water than leg meat with or without salt. At low concn. of salt, cooked breast meat retained more water than raw meats, but this was reversed at higher salt concn. AS

Products

Eggs

- 417 Schott Beyer (R) and Jensen (LS). Over estimation of the cholesterol content of eggs. Journal of Agricultural and Food Chemistry 37(4); 1989; 917-920

In this investigation the comparative results of cholesterol detn. in egg extracts by different methods have been presented as it is reported that the data by colorimetric methods are effected by interfering non-cholesterol substances. It has been found in these studies that the HPLC method resulted in a cholesterol content of 10.97 mg/g wet yolk as compared to 13.86 mg/g wet yolk estimated by colorimetric method with saponified yolk extracts. Recovery of added cholesterol to yolk samples was almost quantitative. It is also seen that by separation of the cholesterol from the remaining unsaponifiable yolk fraction by HPLC revealed that 17.5% of the chromogens present in the colorimetric assay were in the non-cholesterol fraction. It is therefore indicated that a reevaluation of the cholesterol content in eggs has to be carried out using methods based on prior purification of the cholesterol fraction from impurities prior to estimation. NGKR

Quail eggs

- 418 Singh (RP), Anand (SK) and Panda (B). Storage stability of brined quail eggs. Indian Journal of Poultry Science 24(2); 1989; 81-85

Cooked and peeled quail eggs were held either in 4% brine solution alone or brine solution containing 4% common salt, plus 0.4% citric acid and 0.2% sodium benzoate (acidified brine solution) and stored at refrigeration temp. (5 plus or minus 1 C) for 8 wk. Eggs immersed in acidified brine solution had lower pH than those dipped in salt solution. Difference in the pH of the brine solutions was found to have no influence on the diffusion rate of salt into the egg components. Thiobarbituric acid value increased and sensory quality declined in brined quail eggs in 8 wk of storage time. Incorporation of citric acid and sodium benzoate retarded the multiplication of halophilic bacteria and fungi without imparting organoleptically perceptible sourness in the brined eggs and extended their shelf-life up to 8 wk compared to 4 wk in brine solution. KAR

SEAFOODS

- 419 Redmayne (PC). World aquaculture developments. Food Technology 43(11); 1989; 80-81

This article briefly gives the latest trends in farmed seafood. Covers Finnish aquaculture (shrimp, salmon, catfish, crawfish, trout, three other finish species), shellfish aquaculture (oysters, blue muss-

sels, clams, abalone and scallops). SRA

- 420 Rodrick (GE) and Cheng (TC). Parasities. Occurrence and significance in marine animals. Food Technology 43(11); 1989; 98-102

Article summarises the present status of our knowledge of human parasites that are transmissible by seafood to humans. Covers protozoa, trematoda (heterophyids, troglotremitids, echinostomatids, microphallids, schistosomatids) Cestoda, acanthocephalan, nematodes (Anisakids, trichinellids, philometrids) and parasitism measures for control. SRA

- 421 Ward (DR). Microbiology of aquaculture products. Food Technology 43(11); 1989; 82-86

This article addresses to several potential microbiological issues, discussed in terms of practice of aquaculture production, the pathogens and other organisms affecting fish or humans, and the development of microbial resistance to antibiotics. 69 references. SRA

Shrimps

- 422 Srinivasa Gopal (TK), Iyar (TSG), Prabhu (PV) and Gopakumar (K). Alternate code slip for frozen shrimp packaging. Seafood Export Journal 22(2); 1990; 7-9

The code slip used in frozen shrimp packages are of paper make which gets mutilated while thawing the blocks for reprocessing. Investigation carried out for replacing this with polyester tracing sheet of 150 gauge thickness showed that the physical properties like bursting strength, tearing strength, tensile strength, air permeability are comparable with that of paper slip. The additional cost of polyester code slip will be 3 to 4 paise and the slip remains in good condition for use in the frozen shrimp for export. KAR

Fish

- 423 Madhusweta Das and Chatteraj (DK). Quality characteristics of noodles enriched with salt extracted fish protein. Journal of Food Science and Technology, India 26(5); 1989; 272-276

The cooking quality of noodles prepared from wheat flour blended with fish protein isolate and tapioca starch has been compared with that of commercial samples in this investigation. The quality was evaluated by cooking test and sensory evaluation. Results showed that wheat flour noodle with 3% fish protein was found to be more acceptable in respect to overall quality whereas high cooking losses were noticed in noodles containing pregelatinised tapioca starch. NGKR

- 424 Parry (RWH), Alcasid (MV) and Panggat (EB). Cold shock in fish. Its characteristics in bighead. International Journal of Food Science and Technology 22(6); 1987; 637-642

A strong cold shock effect was demonstrated in bighead, and this

was contrasted with the absence of any such effect in rainbow trout. The influence of chilling temp. and delayed icing on this effect was investigated. Bighead exhibited only weak rigor, which could be distinguished from the profound stiffening that followed icing. The degree of cold shock was similar when fish were chilled to 0, 2, 5, and 11 C, but the effect was not observed at 15 or 30 C. Bighead that were allowed to remain at ambient temp. before icing exhibited less pronounced stiffening when iced; the longer these periods at ambient temp., the less rigid the fish became when iced. Fish allowed to enter rigor showed no increase in stiffness when subsequently iced. AS

- 425 Sachindra (SM) and Karunasagar (I). Fractionation of extract from seeds of *Adenanthera pavonia* and effect of these fractions on fish spoilage bacteria. *Journal of Food Science and Technology, India* 26(5); 1989; 283-285

The fraction of extract from seeds of *Adenanthera pavonia* and effect of these fractions on fish spoilage bacteria has been studied in this investigation. The crude extract of Indian red woodseeds (*Adenanthera pavonia*) was separated into 3 main fractions viz. DC-IF, DC-II F and DC-III F by DEAE-cellulose chromatography. Only DC-II F was found to have protease inhibitor (PI) activity and DC-IF which contained ketones inhibited the activity of fish spoilage bacteria to reduce trimethylamine oxide and to produce hydrogen sulphide from cysteine. NGKR

Bluefish

- 426 Armbruster (G), Gall (KL), Gutenmann (WH) and Lisk (DJ). Effects of trimming and cooking by several methods on polychlorinated biphenyls (PCB) residues in bluefish. *Journal of Food Safety* 9(4); 1989; 235-244

The mean concn. of PCBs in the raw untrimmed fillets of the fish was 1.76 p.p.m. on a dry wt. basis. Twice the concn. of PCB's were found in the skin as compared to dorsal and ventral sections. Trimming the fillets resulted in reduction of PCB's residue. Baking, boiling and frying also reduces PCB content. KMA

Catfish

- 427 Jhonsen (PB). Factors influencing the flavour quality of farm-raised catfish. *Food Technology* 43(11); 1989; 94-97

This article discusses the effects of feed ingredients (flavour of fresh fish, flavour of frozen, stored fish), effect of environment, definition of flavour quality and ways to measure it (lexicon flavour descriptors, quantitative sensory analysis, sample presentation) and future needs. 17 references. SRA

Pomfrets

- 428 Fazal (AA) and Srikar (LN). Effect of accumulated free fatty acids on reduction of salt soluble proteins of pomfret and seer fish during

frozen storage. Journal of Food Science and Technology, India 26(5); 1989; 269-271

In this paper the effect of free fatty acids (FFA) released during frozen storage on protein solubility in seer fish and pomfret with varying amounts of total lipids has been reported. Two sp. of marine fish viz. seer fish (*Scomberomorus guttatus*) and pomfret (*Pampus argenteus*) purchased from Mangalore fish market, transported to lab. in iced condition, one inch thick steaks were made and at once frozen in a coil freezer. Packing of 500 g. steaks was done in frozen in a polyethene bags and stored at -20 plus or minus 2 C. Results showed that the FFA content increased rapidly followed by marked decrease of PL during frozen storage. There was also found marked decrease of salt soluble protein throughout the storage period especially during the first 30 days whereas SSP seemed to level off beyond 150 days. It has been shown that FFA released during storage caused protein denaturation. NGKR

Sucker

- 429 Owusu-Ansah (YJ), McCurdy (AR) and Kopp (TG). Viscosity changes of actomyosin and properties of surimi from sucker (*Catostomus commersoni*). Canadian Institute of Food Science and Technology Journal 21(5); 1988; 531-533

The viscosity of sucker actomyosin solutions decreased with increasing temp. up to 38 C, then rapidly increased; peaking at 43 C. The gelation of sucker actomyosin was similar to those of other fish used in the surimi industry. Kamaboko prepared from sucker surimi was rated as grade A in fold tests and remained unchanged during four wks of refrigerated storage. The hardness of the kamaboko significantly increased with storage but did not adversely affect the quality as judged by the fold test. AS

Trouts

- 430 Stone (RA) and Kinsella (JE). Bleaching of beta-carotene by trout gill lipooxygenase in the presence of polyunsaturated fatty acid substrates. Journal of Agricultural and Food Chemistry 37(4); 1989; 866-868

The 12-lipoxygenase (LO) from trout gill effectively bleaches beta-carotene in conjunction with the peroxidation of different polyunsaturated fatty acid (PUFA) substrates. The max. velocity of bleaching differed significantly between LO from gill and the 15-LO from soybean for six PUFA substrates, compared to linoleic acid. The lag times before reaching max. velocity of bleaching were shorter for trout gill LO than were those catalyzed by soybean LO for six of the eight PUFA substrates tested. This may reflect the presence of oxidative cofactors in the trout gill LO preparation. AS

Products

Fish

- 431 Akande (GR), Knowles (MJ) and Taylor (KDA). Improved utilization of flesh from mackerel as salted dried fish cakes. International Journal of Food Science and Technology 23(5); 1988; 495-500

The comp. and yield of mince prepared by passing mackerel (*S. scombrus*) frames through a flesh-bone separator were determined. Salt (10 to 40%) was added to the unwashed mince to prepare dried cakes with enhanced keeping quality. The dried cakes were assessed for peroxide and TBA values, total viable count and for sensory attributes after preparation and after a 3-month storage period at 29 plus or minus 1 C. The cakes were reconstituted by desalting in boiling water. Salted dried cakes prepared with 15, 20, 30 and 40% salt were found to be stable and have little sensory deterioration over the 3-month storage period which is adequate to simulate distribution of products at tropical ambient temp. AS

Fish sauces

- 432 Velayutham (P) and Jegatheesan (G). Effect of solar radiation on fish sauce. Indian Journal of Nutrition and Dietetics 25(10); 1988; 311-314

The quality of fish sauce produced at ambient temp. and after exposing to sunlights has been studied. Samples of fish sp. (*Leiognathus equulus*) along with slightly spoiled fishes were mixed with salt in 2:1, 3:1 and 4:1 ratios and fermented at ambient temp. and another set exposed to sunlight for 10 h daily. Fish fermentation was done in plastic containers of 5l capacity, crude filter paper or cotton was used to filter the clear liquid from the fermented samples. The fish sauce samples collected at the end of 3 and 6 months were analysed for pH, salt, solids, protein, amino-N, trimethylamine (TMA), total volatile N (TVN), and total volatile acid (TVA). The protein and amino N values of sauce samples produced using solar radiation (38 C) showed a higher value than ambient temp. (28 C). The values of TMA and TVN for both temp. were also within acceptable level. The 4:1 ratio was found to be the best as well as the one produced from solar radiation in respect to protein and amino N level. NGKR

PROTEIN FOODS

Nil

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

- 433 Nagel (CW) and Herrick (IW). The effect of malate or lactate content on the pH - TA relationship of potassium bitartrate saturated alcohol-

water solutions. American Journal of Enology and Viticulture 40(2); 1989; 81-85

To show the effect of organic acid comp. on pH and titratable acidity (TA), an algorithm was derived using the dissociation constants of the acids determined in 0%, 10%, and 20% (v/v) ethanol solutions and the solubility product of potassium bitartrate. Using published solubility products for potassium bitartrate solutions and assuming a 0.15% concn. for succinic acid, the effect of variation of the concn. of malic or lactic acid on TA and tartrate and K^+ content in ethanol/water solutions at different pH values could be calculated with the formulas and computer. Tables were constructed showing the predicted malic or lactic acid content in ethanol/water solutions at a particular TA and pH. AS

Alcoholic beverages

Beer

- 434 Calderbank (J) and Hanmonds (JRM). Influence of nitrate and bacterial contamination on the formation of apparent to fat -N- nitroso compounds (ANTC) during fermentation. Journal of the Institute of Brewing 95(4); 1989; 277-287

Formation of Apparent Total N-Nitroso Compounds (ATNC) was monitored throughout fermentations of all-malt ale worts supplemented with nitrate (0.100 mg litre (0.100 p.p.m.)). The pitching yeasts were obtained from commercial breweries and contained different levels of the contaminant bacterium *Obesumbacterium proteus* (0-2.1% by number). Levels of ATNC present at the end of fermentation were dependent on both initial wort nitrate levels and the initial level of bacterial contamination of the pitching yeast. Only relatively low nitrate levels were required to produce ATNC levels greater than the Brewers Society recommended limit of 20 ug litre (p.p.b), provided that the bacteria were present. Indeed, the use of whole hops alone would contribute sufficient nitrate to the wort to produce excessive amounts of ATNC, provided *O. proteus* was present. The only feasible solution to ATNC production during fermentation is to remove the contaminating bacteria from both the pitching yeast and brewing plant. Effective removal of *O. proteus* can be achieved by acid washing the pitching yeast under carefully controlled conditions, prior to fermentation. AS

- 435 Delcour (JA), Hennebert (MME), Vancraenenbroeck (R) and Moerman (E). Unmalted cereal products for beer brewing. Part I. The use of high percentages of extruded or regular corn starch and sorghum. Journal of the Institute of Brewing 95(4); 1989; 271-276

Debranned sorghum, debranned extruded sorghum, corn and corn starch were used as brewing adjuncts (50%) in a micro brewing process and the quality of beer was evaluated. Infusion mashing method was followed to prepare wort. Filtration time for corn starch and extru-

ded corn starch was 90 min. for both and debranned sorghum for 180 min. whereas mash from extruded sorghum was of gel consistency and necessiated decantation. The formation of lipid amylase complex during extrusion caused higher saccarification time and imparted slight turbidity to wort. Beer prepared from debranned sorghum, corn starch and extruded corn starch were comparable to all malt beer where as that prepared with extruded sorghum was found to have unacceptable aroma. NGM

- 436 Sanni (AI). Chemical studies on Sekete beer. Food Chemistry 33(3); 1989; 187-191

The chemical comp. of sekete beer and the maize used in its preparation are reported. Apart from Ca, decreases in the values of P, Mg, K and Na were observed in the beer. Riboflavin and niacin contents increased at the end of fermentation while thiamine decreased slightly. An increase in the moisture, N and protein contents is reported. The ash and crude fibre contents, however, decreased. AS

- 437 Ybanez (N), Navarro (A) and Montoro (R). Determination of cadmium, cobalt, copper, lead, and zinc in beer by flame atomic absorption spectroscopy. Journal of the Institute of Brewing 95(4); 1989; 257-262

Wines

- 438 Drysdale (GS) and Fleet (GH). The growth and survival of acetic acid bacteria in wines at different concentrations of oxygen. American Journal of Enology and Viticulture 40(2); 1989; 99-105

The growth of *Acetobacter aceti*, *A. pasteurianus* and *Gluconobacter oxydans* was examined in three wines held at 100%, 70% and 30% to 50% dissolved oxygen and correlated with changes in concn. of wine sugars, alcohols, organic acids, acetaldehyde, and ethyl acetate. Both *A. pasteurianus* and *A. aceti* grew to populations of 10^6 cfu/mL in fully aerated wines. Weaker growth occurred at lower dissolved concn. Growth was accompanied by reductions in the concn. of ethanol and increases in the concn. of acetic acid. Other changes included reductions in the concn. of some organic acids and glycerol and increases in the concn. of acetaldehyde and ethyl acetate. *Gluconobacter oxydans* did not grow in the wine samples. AS

- 439 Nagel (CW) and Weller (KM). Colorimetric determination of urea in wine. American Journal of Enology and Viticulture 40(2); 1989; 143-144

A colorimetric method for the analysis of urea in wine and juices, capable of accurately estimating the urea content at concn. as low as 1 mg/L, is described. Nitrogen compounds other than carbamido compounds do not interfere with the reaction. AS

- 440 Sponholz (WR), Dittrich (HH) and Bausch (N). Volatile fatty acids in fruit wines, fruit desert wines and fruit brandies. Deutsche Lebensmittel-Rundschau 85(8); 1989; 247-251 (De).

Fruit and fruit dessert wines, as also fruit brandies were ana-

lysed on their free volatile acid comp. As expected, acetic acid is the main component. Often formic acid is analysed in high concn. depending on mold metabolism. The other volatile acids are found in fruit wines in minor amounts or are not detected. The higher amount of 2-methylbutyric acid compared to 3-methylbutyric acid is noticed in apple products. This phenomenon is found also in French and German apple distillates in a ratio up to 4.3:1. In Calvados propionic acid is clearly higher than in German brands. In distillates of Williams pears the amount of 2-methylbutyric acid is up to 107:1 higher than that of the other isomer. Whereas in other pear distillates it is comparable with apples. Also in apricot brandies 2-methyl- is higher than 3-methylbutyric acid and also propionic and butyric acid may be high. In a spoiled product propionic-, butyric- and 2-Methylbutyric acid are extremely high. Distillates from plums mainly show low concn. of free volatile fatty acids. But only in one Slivowitz 69 mg/l of butyric acid was analysed comparable with the literature values. Distillates from cherries are mainly poor in volatile acids, but propionic acid may be increased. Raspberry spirit only shows amounts of free fatty acid as pure spirit from grain. AS

- 441 Tegmo-larsson (IM), Spittler (TD) and Rogriguez (SB). Effect of malolactic fermentation on ethyl carbamate formation in Chardonnay wine. American Journal of Enology and Viticulture 40(2); 1989; 106-108

Malolactic fermentation of a Chardonnay wine with five different strains of lactic acid bacteria (*Leuconostoc oenos*) showed no detectable amounts ($< 10 \mu\text{g/L}$) of ethyl carbamate. Heating of these wine samples, however, produced around $100 \mu\text{g/L}$ of ethyl carbamate. Control samples which had not undergone malolactic fermentation contained, after heating, amounts of ethyl carbamate similar to the malolactic-fermented samples. Removal of the yeast by sterile micro-filtration did not affect the ethyl carbamate formation during heating. AS

Non-alcoholic beverages

Coffee

- 442 Blance (MB), Davis (GE), Parchet (J-M) and Viani (R). Chromatographic profile of carbohydrates in commercial soluble coffees. Journal of Agricultural and Food Chemistry 37(4); 1989; 926-930

An analytical method based on the chromatographic profile of instant coffee samples has been developed in order to know the type of coffee extraction conditions etc but also the nature of adulterants or additives used in these products. This has been found possible by detn. of both free and total sugar contents by HPLC, GC and TLC methods. The results showed that pure soluble coffee irrespective of the extraction conditions contained max levels of 0.3% total xylose and sucrose about 2% total glucose and absence of maltose. Some samples showed higher levels of one or more of the above sugars. Higher quantities of total xylose indicated use of coffee husks and parchment. The extent of free fructose and glucose distinguished use of either raw or roasted husks. The indication of addition of maltodextrins is

shown by high levels of maltose and total glucose whereas addition of caramelised sugar increased the levels of sucrose and total glucose. NGKR

- 443 Menon (SN). Quality improvement on the estate and processing technology in coffee. Indian Coffee 53(12); 1989; 15-20

This article covers various aspects in farm processing of coffee which includes selection of uniformly ripe berries, pulping, demucilaging or fermentation, removal of mucilage by alkali and by friction, washing with water and drying and storage. These processing steps as practised in India are compared with some other countries like Kenya, Mexico and Brazil and indications have been given as to how good processed coffee could be got. In drying, it is suggested that mechanical drying gives good coffee compared to sun-drying and procedure to be followed in mechanical drying of coffee is indicated. KAR

Fruit juices

Lime juices

- 444 Narendra Mohan and Ashutosh Bajpai. Use of lime in juice purification - a panorama. Indian Sugar 39(10); 1990; 739-743

The factors influencing the quality of the lime including the working of lime kiln, process involved in the preparation of milk of lime and how the quality of juice determined, the extent of milk of lime needed for clarification are the aspects covered. KAR

Orange juices

- 445 Parish (ME) and Higgins (DP). Extinction of *Listeria monocytogenes* in single-strength orange juice. Comparision of methods for detection in mixed populations. Journal of Food Safety 9(4); 1989; 267-277

The FDA method of selective enrichment followed by selective plating on modified MC Bridge agar was capable of detecting the presence of *L. monocytogenes* in a reconstituted single strength orange juice at the 10^6 cfu/ml level. KOH treatment was required for *Listeria* detection in juice which had high background microflora (10^8 cfu/ml). KMA

- 446 Skurray (GR), Luckman (GJ) and Leach (D). Folic acid and ascorbic acid content of concentrated and single strength orange juice. ASEAN Food Journal 4(2); 1988; 77-78

FATS AND OILS

- 447 Mazza (G) and Marshall (HH). Onosmodium seed, a potential source of gamma-linolenic acid. Canadian Institute of Food Science and Technology Journal 21(5); 1988; 558-559

Seeds of *Onosmodium hispidissimum* Mack., collected at three locations in southern Manitoba, were analyzed for seed characteristics, oil content and fatty acid comp. Whole seed contained 16.7 to 18.4% oil of which over 22% was gamma-linolenic acid (18:3). The other fatty acids present in the oil were palmitic (16:0), stearic (18:0), oleic (18:1), linoleic (18:2), alpha-linolenic (18:3), tetraenoic (18:4) and eicosenoic (20:1) acids. The seeds of *O. hispidissimum* contained 2.8% more gamma-linolenic, 2.6% more linoleic and 4.4% less oleic acid than those of *O. occidentale* Mack., a previously characterized source of gamma-linolenic acid and may find application in the health food and pharmaceutical industry. AS

Fats

- 448 Hunt (C), Larn JE and Adamczuk (ZC). Proximal composition and fat type of three popular take-away meals. *International Journal of Food Science and Technology* 22(6); 1987; 669-675

Random samples of three popular types of take-away meal (fish and chips, chicken chow mein and meat curry) were bought from various outlets in a town in the North of England. They were analysed for protein, sodium and amount and type of fat. The fat content of the fish and chips was very high, and less high in the chow meins and curries. In all three types of meal, the fat was mainly saturated and monounsaturated, although in the fish and chip samples the saturated fraction was particularly high; traditionally they are fried in beef dripping. Although the amount of polyunsaturated fatty acid (PUFA) is lower in products fried in oil, preliminary results from this study suggest that up to half of this may be in the trans-form; this is alleged to be no better than saturated fatty acid in effect on blood cholesterol. The study clearly indicates wide variation in both amount and type of fat within one meal type, and throws serious doubt on the feasibility of implementing meaningful nutritional labelling information in take-away outlets. The amount of sodium in the Chinese meals was particularly high. AS

- 449 Perez-Camino (MC), Marquez Ruiz (G), Salgado Raposo (A) and Dobarganes (MC). Frying fat alteration. III. Correlation between analytical indices and methods for the direct evaluation of degradation compounds. *Grasas Y Aceites* 39(2); 1989; 72-76

In this study, the possibilities for the analysis of used frying fats using simple and rapid analytical indices are defined in comparison with chromatographic methods that quantify the new compounds originated during the thermoxidative process. 140 samples have been evaluated using the following detn.: polar compounds, polar methyl esters, non polar dimers, free fatty acids, smoke point and Perevalov colorimetric test. The samples were divided in 3 groups depending on their origin (thermoxidised oils and frying fats coming from both domestic and industrial fryers) and correlations between the different detn. were calculated for each group and for all the frying fats. The results demonstrate that the selected indices can only be applied when constant values for the parameters affecting the fat during deep frying are established and that it is necessary to use a chromatogra-

phic method for the evaluation of samples of unknown history. AS

Butter

- 450 Ulberth (F) and Blineder (S). Determination of copper and iron in butter by atomic absorption spectroscopy. *FAT Science and Technology* 9(5); 1989; 185-188

A pressurized digestion method for the detn. of trace of Cu and Fe in yellow fats (butter) by atomic absorption spectroscopy is described. As the specimen is only in contact with inert materials (PTFE) in a closed system during the digestion period contaminations are minimal. The repeatability of the method, expressed as relative standard deviation, was 7.13% for Cu and 8.56% for Fe. Standard recovery was better than 95% for both elements. The Cu and Fe content of 128 Austrian butter samples evaluated with the described procedure averaged 0.025 p.p.m. Cu and 0.167 p.p.m. Fe resp. AS

Butterfat

- 451 Younes (NA) and Soliman (MA). Adulteration of butterfat. Trans-unsaturation content. *Crasas Y Aceites* 39(2); 1988; 69-71

The trans-unsaturation content of 30 samples of milkfat ranged from 4.14% to 7.57% with an average 5.68%. Max. values were obtained in May, August and December. Min. values were recorded in February, March and July. It is concluded that the level of trans-unsaturation in milkfat is influenced by the nutrition level and the level of unsaturated lipid presents in pasture that increases the unsaturated dietary lipids consumed. The use of hydrogenated cottonseed oil as an adulterant for the authentic milkfat was carried out. The hydrogenated cottonseed oil was added to the bulk milkfat in the ratios of 10%, 20% and 30%. The trans-unsaturation content of hydrogenated cottonseed oil was 25.40%. The addition of hydrogenated cottonseed oil to milkfat in the ratio of 10% w/w increased the trans-unsaturation content of the bulk milkfat from 5.30% to 8.88%, the trans-unsaturation content of the milkfat was increased to 10.72% and 14.45%, when the added hydrogenated oil was 20% and 30%, resp. AS

Oils

- 452 Byrne (M). The changing face of oils and fats. *Food Manufacture* 64(1); 1989; 31-37

This article presents an overview of the changing market for yellow fats and cooking oils and fats. SRA

- 453 Kaimal (TNB) and Saroja (M). Modification of vegetable oils by lipase catalyzed interesterification. *Journal of the Oil Technologists' Association of India* 21(1); 1989; 2-10

Lipase catalyzed interesterification (acidolysis) was investigated to modify groundnut oil (GO), mustard oil (MO), coconut oil (CO) and soybean oil (SO), to improve the nutritional qualities and shelf-

life. Lipase from *Rhizopus delemar* in free form and lipase from *Mucor miehei* and porcine pancreatic lipase were used in the immobilized form. With *Rh. delemar* lipase, S0, M0 and G0 were modified with lauric and oleic acids. Interesterification of S0 and M0 reduced the linolenic acid marginally; in G0, the content of long chain acid decreased from 6.0 to 3.7%. With pancreatic lipase the S0 interesterified with lauric acid, the extent of incorporation of lauric acid was comparable to that obtained with *Rh. delemar* lipase, but the reduction in linolenic acid content was better. Interesterification reaction rate decreased with increase in temp. (tried 40, 50 and 60 C). Interesterification of S0 with the three enzymes could not reduced the linolenic acid content. Interesterification of vanaspathi with different molar proportions of short chain acids in packed bed of lipozyme at 60 C indicated that the incorporation of butyric acid was negligible; but there was slight improvement in flavour as revealed by sensory evaluation tests. The fried product left a greasy feeling in the mouth. Interesterification of C0 to improve the linolenic acid with a mixture of 10:0 (8.6 g) and 14:0 (11.4 g) and safflower oil (10 g) in a continuous reaction with lipozyme at 60 C gave a product with linolenic acid content of 8.2% and a total content of palmitic and stearic acid of 6.4%. Methanol did not exert any perceptible effect on the interesterification of C0. Extent of incorporation of 14:0 to C0 was better at 60 C than at 50 C. Addition of about 0.2% water to the oil-fatty acid mixture showed a higher incorporation of the added fatty acid. KAR

Amaranthus seed oils

- 454 Becker (R). Preparation, composition and nutritional implication of amaranth seed oil. *Cereal Foods World* 34(11); 1989; 950-953

This review article provides information on the physical and chemical characteristics of amaranthus seed and preparation, comp. and nutritional implication of amaranthus oil. FHR

Palm oils

- 455 Arumughan (C), Sundaresan (A), Prasad (KVS), Damodaran (AD) and Nampoothiri (KUK). Studies on the extraction and evaluation of raw palm oil for edible use. *Journal of Food Science and Technology, India* 26(5); 1989; 277-282

Design data for the fabrication of palm oil extraction equipments for small scale units and manufacturing details for production of edible grade raw palm oil as a nutritional oil have been presented in this paper. Pilot plant trails with fresh fruit bunches harvested from CPCRI, Trivandrum have been conducted and it was seen that the palm oil produced had less than 1% free fatty acids, 0.2% moisture and impurities. The oil was found to be of high quality as shown by analytical values and as it contained 700 p.p.m. carotenes was good source of vitamin A. Technical know how for manufacturing of 0.7 tonnes capacity of fresh fruit bunches per hour has been developed by CPCRI and a demonstration plant has also been set up at Trivandrum as a Joint venture of R.R.L. and CPCRI. NGKR

- 456 Parvathi Easwaran (P) and Sailaja (YS). Acceptability studies on selected recipes using raw palm oil. *Indian Journal of Nutrition and Dietetics* 25(11); 1988; 331-337

Imported palm oil is being recently used in India to meet the oil shortage. The acceptability, keeping quality and physico-chemical changes after cooking and storing were carried out with seven recipes prepared using raw palm oil. Potato chips, diamond cuts, ribbon pakodas, chapatias, egg omlettes tamarind rice and Bengal gram sundal were evaluated by a panel of judges aged 20-35 yrs. Some recipes were tested for shelf-life and were evaluated after 5, 15 and 25 days of storage. Fresh palm oil and residual oil were analysed for sp. gr., viscosity, refractive index and acid value. Results were compared with that obtained from traditional groundnut oil. The findings revealed that palm oil had high viscosity 3,924 dynes cm, sp. gr. 0.9146, refractive index 1.4545 and free fatty acids 0.8415. Only in deep fat fried products the acceptability scores were statistically significant. Shelf-life of the products were comparable with those of groundnut oil products and the pattern of variation in physical constants was also similar to that of groundnut oil. Palm oil is well accepted for shallow fat frying and seasoning than deep fat frying. No undesirable changes were seen during cooking and storage. Palm oil is cheaper than groundnut oil. NGKR

Rapeseed oils

- 457 Kalmokoff (ML), Pickard (MD) and Groot Wassink (JWD). Resistance of green pigments in commercial canola oil to enzymatic hydrolysis. *Canadian Institute of Food Science and Technology Journal* 21(5); 1988; 534-536

Bleaching of degummed green canola (rapeseed) oil by means of enzymatic hydrolysis was studied. Green oil results from the processing of immature seed (*Brassica napus*). The green pigments comprise mainly pheophytins and minor amounts of chlorophylls. Pheophytins are derived from chlorophylls during the commercial crushing process. In buffer/acetone solution, chlorophylls and pheophytins were hydrolyzed by chlorophyllase. However, in the presence of oil, chlorophyllase hydrolyzed only the chlorophylls and not the pheophytins. AS

Rice bran oils

- 458 Raghuram (TC), Rao (UB) and Rukmini (C). Studies on hypolipidemic effects of dietary rice bran oil in human subjects. *Nutrition Reports International* 39(5); 1988; 889-895

The hypolipidemic action of dietary rice bran oil (RBO) was investigated in human subjects. Twelve subjects either with high serum cholesterol or high triglycerides were advised to use RBO in place of other cooking oils which they were using earlier. There was a significant reduction in serum cholesterol and triglyceride levels after 15 and 30 days after the use of RBO in the diet. In nine control subjects there were no changes in the serum cholesterol and triglyceride levels. RBO could be considered as a edible oil of pre-

ference for patients with abnormalities of lipid metabolism. AS

- 459 Sarkar (S) and Bhattacharyya (DK). Studies on characteristics of rice bran. Journal of the Oil Technologists' Association of India 21(1); 1989; 11-12

Ten samples of rice bran collected from different growing areas of West Bengal (India) and Orissa (India) have been analysed for total lipid, protein and ash and the fatty acid comp. of the total lipid. The total lipid varied from 19.0 to 23.0%, ash from 12.3 to 18.6%, protein from 15.2 to 18.5% and sand/silica from 3.7 to 8.8%. The free fatty acid content was between 3.0 and 5.5% and the oils were also not very light coloured. The total lipid (oil) of the rice bran oil showed 16.3-21.4% palmitic acid, 39.8 to 47.5% oleic acid and 31.1-34.9% linoleic acid which are the major fatty acids. KAR

SPICES AND CONDIMENTS

Spices

- 460 Anon. R & D in spices - I. Indian Spices 26(2); 1989; 16-17

This is a brief review of the work done on spices at the Central Food Technological Research Institute, Mysore, covering areas like spices, oleoresins, super-critical extraction of spice oils, encapsulated spice flavours and spice mix slabs. KAR

- 461 Narvaiz (P), Lescano (G), Kairiyama (E) and Kaupert (N). Decontamination of spices by irradiation. Journal of Food Safety 10(1); 1989; 49-61

Inactivation of microflora of foreign spices by means of gamma-radiation was studied. Ground cinnamon, clove, coriander, nutmeg, white and black pepper were irradiated with 7 and 10 kGy of ^{60}Co . Microbiological results showed that aerobic plate count was reduced by 2.5 to 4.0 log cycles with 7 kGy. There was no difference in the sensory property due to irradiation. KMA

Juniper

- 462 Kallio (H) and Junger-Mannermaa (K). Maritime influence on the volatile terpenes in the berries of different ecotypes of juniper (*Juniperus communis* L.) in Finland. Journal of Agricultural and Food Chemistry 37(4); 1989; 1013-1016

In this paper the effect of the three forms of *Juniperus communis* L. in Finland and the influence of maritime environment on the comp. of the berry volatile oils have been studied and the results presented. The juniper berries and widely used on spice mixtures, perfumes and pharmaceutical products and their volatile oils are used in alcohol and beverage industry and their quality differences are due to biological variations. The volatiles are isolated by steam dis-

tillation and total volatiles are determined together with their GC-MS analytical studies. The results showed atleast 0.4-2.5% volatile compounds calculated on fresh wt. basis and 0.5-4% on a dry wt. basis. The quantities and relative percentages of humulene and of the sum of beta-elemene, caryophyllene, and terpinen-4-ol decreased gradually from the maritime growth site toward the coast. The relative percentage of alpha-terpinolene, also showed similar trend. NGKR

Pepper

- 463 Lawless (H). Pepper potency and the forgotten flavour sense. Food Technology 43(11); 1989; 52, 57-58

The effects of pepper, future outlook on hot spices, their continued popularity, and advantages offered by them are discussed. Covers var. of pepper, sensory measurement of pepper, heat, physiological reactions to pepper, psychophysical studies, anesthetic properties and future outlook. SRA

- 464 Verghese (J). White pepper-the "Topless" *Piper nigrum* L. berries. Indian Spices 26(2); 1989; 19-24

A description is given of the green pepper retting process for preparing white pepper by traditional method; the steam blanching process, the black pepper retting process, and sterilization are included. Specifications for white pepper; the oil and piperine content; oleoresin extraction, organoleptic quality, and preference of white pepper in West European countries are also covered. 47 references. KAR

- 465 Verghese (J). Solubilised, homogenised and emulsified black pepper oleoresin. Indian Spices 26(3); 1989; 16-18

Methods available for preparing soluble and emulsified black pepper oleoresin including the use of levulinic acid, anhydrous lactic acid. Fagen's process of homogenisation and a couple of patented processes on black pepper oleoresin have been covered. KAR

Turmeric

- 466 Viasan (AC) Mirmala Menon (A), Madhusudhana Rao (I), Narayanan (CS), Mathew (AG). Chemical analysis of some cultivars of *Curcuma longa* Linn. Journal of Food Science and Technology, India 26(5); 1989; 293-295

As the relative curcuminoid content of *Curcuma longa* Linn. is important for the total colour. This investigation was carried out to study the comp. of the curcuminoids in different cvs of turmeric. Eleven cvs of turmeric were analysed for the three colouring pigments curcumin demethoxycurcumin and bis-demethoxy curcumin by TLC separation followed by UV/visible spectrometry. The results showed that the hybrid variety "PCT-10" was found to be promising for trade purpose and cultivation. The two mono terpenes alpha-pinene and beta-pinene were identified for the first time in the essential oils.

NGKR

SENSORY EVALUATION

Nil

FOOD STORAGE

- 467 Pai (TK) and Sastry (SK). Effects of refrigerated storage conditions on microbial activity of selected perishables. *International Journal of Refrigeration* 12(6); 1989; 350-353

The effects of storage temp. and high relative humidity on the microbial activity of mature green tomato ('Dombito'), mushroom ('Sylvan Hybrid White') and apple (Red Delicious') were investigated at three temp. (5, 10 and 15 °C), and four different relative humidity levels (91, 94, 97 and 100%). Relative humidity effects were not found to be statistically significant for the ranges of variables investigated. The microbial counts for tomatoes were not very high during storage (< 650 colony forming units per cm²), due in part to low initial counts. In mushrooms, the bacterial population was much higher (about 4 log scales) than the yeast and mould population throughout the storage period. These data also showed some evidence of a competitive relationship between bacterial and yeast and mould populations at 5 °C. The final microbial count for apples at each temp. was less than 300 CFU per cm² AS

INFESTATION CONTROL AND PESTICIDES

Infestation control

- 468 Fargo (WS), Epperly (D), Cuperus (GW), Clary (BC) and Noyes (R). Effect of temperature and duration of trapping on four stored grain insect species. *Journal of Economic Entomology* 82(3); 1989; 970-973

Capturing stored grain insects with drop traps in wheat was affected by insect sp., grain temp., and trapping duration. These results were obtained using four insect sp. (*Tribolium castaneum* (Herbst), *Sitophilus oryzae* (L.), *Rhyzopertha dominica* (F.), and *Cryptolestes ferrugineus* (Stephens)), three grain temp. (10.0, 21.1, and 32.2 °C), and four trapping intervals (1, 2, 4, and 7 d). Higher grain temp. resulted in significantly more insects trapped when all sp. were combined. This significance is largely due to the highly significant numbers of *C. ferrugineus* captured at high temp. The other sp. followed the same pattern. At each temp., *C. ferrugineus* was caught in the greatest numbers and *R. dominica* in the least. *S. oryzae* and *T. castaneum* were captured in intermediate numbers. Across sp. longer trapping durations resulted in significantly more insects

being captured. Across durations, *C. ferrugineus* was caught the most, *R. dominica* the least, with the other two sp. intermediate. Within sp., only *C. ferrugineus* showed significant differences in the number trapped among the sampling periods. The trend, however, was consistent for all insect sp. This study emphasizes the need to consider differences in insect sp., grain temp., and trapping durations when drop traps are used to estimate insect abundance. AS

- 469 White (NDG) and Loschiavo (SR). Factors affecting survival of the merchant grain beetle (Coleoptera: Cucujidae) and the confused flour beetle (Coleoptera: Tenebrionidae) exposed to silica aerogel. *Journal of Economic Entomology* 82(3); 1989; 960-969

Mortality of *Oryzaephilus mercator* Fauvel exposed to 0.72 mg/cm silica aerogel (SG-67) bound to paper was directly related to length of exposure of the insects and length of time between exposure and placement in food. Exposures of 15 S killed 97% of starved adults in 2 d, but mortality was low if adults had access to food within 2 h. As exposure times increased, insects survived only if food was available at shorter intervals. Type and quantity of food also affected mortality. Mortality of *O. mercator* adults exposed to SG-67 was greater on bread crumbs and whole rolled oats than on ground rolled oats. Starved *Tribolium confusum* Jacquelin du val required exposures of 6 h to SG-67 for complete mortality; the presence of food following exposure, rather than type or quantity, affected survival, although mortality was slightly higher on bread crumbs. Early larval instars of *O. mercator* and *T. confusum* were more susceptible than late instars, which responded to SG-67 in the same way as adults. Adults of both sp. exposed to SG-67 and subsequently held in inert cellulose powder died within 1-3 d, but many insects in ground rolled oats survived, probably because they had ingested and metabolized food and produced metabolic water. Adult *O. mercator* immobilized at 2.5 °C during exposure to SG-67 for 4 h, then held at 25 °C without food, were unaffected by the treatment. Exposures of *O. mercator* for 15-60 s to silica aerogel on an adhesive surface will effectively control these insects if they cannot find food immediately. *T. confusum* cannot be controlled with exposure times of less than 6 h. AS

BIOCHEMISTRY AND NUTRITION

- 470 Ihekorony (AI). A rapid in vitro enzymic and chromatographic predictive model for the in vivo rat-based protein efficiency ratio of mixed food proteins. *Nahrung* 32(8); 1988; 789-793

A nutritional quality index in the nature of an enzymatic protein efficiency ratio (E-PER) was computed from the amino acid data of 18 different food products by means of multiple regression equations. The regression was performed by setting amino acid values derived from enzymic hydrolysis of the food proteins as the independent variables with the rat based PER values as the dependent variables. The multiple regression gave the following equations. $E-PER = -3.02 + 0.14(asp) + 0.15(glu) - 0.18(pro) + 0.14(ala) + 0.52(met) + 0.21(lys) +$

0.09(arg) - 0.45(trp). The multiple correlation coeff. for this regression was 0.942 and the coeff. of variation was 88.7%. The prediction equation was tested on amino acid-PER data of 22 different foodstuffs and it successfully predicted (plus or minus 0.22) the PER of 17 and an effectiveness of 77.3%. AS

- 471 Ihekoroyne (AI). Estimation of the biological value of food proteins by a modified equation of the essential amino acid index and the chemical score. *Nahrung* 32(8); 1988; 783-788

A modified essential amino acid index equation incorporating a digestibility factor (MEAAI) and a chemical score index (CSI) were developed from the essential amino acid profile of 18 different food proteins hydrolysed by the combined but sequential action of papain and pronase E enzyme systems. The essential amino acid comp. of whole egg was used as a reference standard. The following equations were proposed: $\log \text{MEAASI} = 1/8 \log (100a)$ in which a is the value of the limiting amino acid in the sample, and a_e is the corresponding value in whole egg. Both equations were used to calculate the biological value of different protein foodstuffs. There was a close agreement between values obtained using the equations and reported values for the same foodstuffs published in the literature. There was also a close correlations ($r = 0.665$) between data obtained using MEAAI and those obtained using CSI in estimating biological values, suggesting that either equation could be used reliably and solely to estimate protein biological value of foods. AS

- 472 Kanchana (S) and Shurpalekar (KS). Effect of fibre and phytate of regional diet on the apparent absorption of zinc in rats. *Nutrition Reports International* 39(4); 1989; 727-734

The effects of reducing the phytate content of the ragi based regional diet and addition of fibre as NDF, absorption, serum and femur concn. of Zn were studied in rats. The activity of intestinal phosphatases was also studied. The growth response of rats fed the regional diet was lower than those fed semisynthetic diet. Removal of phytate from the ragi diet did not result in an impaired growth response. Total absorption of Zn was lower on the semisynthetic diet than on the ragi based regional diet which contained higher amounts of Zn than the former diet. On similar Zn intakes, per cent absorption of Zn on the regional diet increased significantly, when the phytate content of the regional diet was reduced by phytase. Addition of NDF to the semisynthetic diet had no effect on the Zn absorption. The serum and femur Zn concn. in rats fed different experimental diets were within the normal range of values. In rats fed the regional diet, the alkaline phosphates and phytase activities were significantly lower than in those fed semisynthetic diet with and without NDF. Dephytinizing the regional diet increased the activity of the enzymes to levels observed on semisynthetic diets. AS

- 473 Sevenhuysen (GP) and Wadsworth (LA). Food image processing. A potential method for epidemiological surveys. *Nutrition Reports International* 39(3); 1989; 439-449

Measurement of food consumption for epidemiological surveys is

subject to several errors, one of which is the quantification of individual intakes. A photographic procedure is described to decrease subjectivity in food amount measurements. The procedure uses trigonometric calculations of photographic coordinates to estimate separate vol. of the items shown. The principle of vol. calculation was tested in the lab., using a symmetrically shaped object and a series of 23 commonly eaten food items. Results show that mean estimates are close to actual amounts. The principle has been shown to perform within the accuracy often required for food consumption surveys. AS

- 474 Varela (P), Marcos (A) and Requejo (A). Evaluation of nutritive status in sportswomen assessment by immunocompetence. *Nutrition Reports International* 39(5); 1989; 949-955

There is scant evidence that physical activity is the major variable that affects energy expenditure and hence caloric and protein requirements. Interrelationships among immunity and nutrition have stimulated great interest and recently the immunocompetence has been used to evaluate nutritional deficiencies. The most prominent effects of nutritional deficiencies are observed on cell-mediated immunity. Therefore the aim of this work was to evaluate nutritional status throughout the immunocompetence in young women with different physical activity rate (12 training in sports and 13 maintaining sedentary habits). Total leukocyte and lymphocyte count as well as lymphocyte percentage were tested, and the following lymphocyte subsets; CD2, CD4, CD8, CD20 and NK cells were evaluated by Flow Cytometry. Leukocyte and lymphocyte counts and total B cell percentage significantly decreased but decreases in CD2, CD4, NK and CD4/CD8 as well as the increase in CD8 were not significant in sportswomen compared to controls. Therefore these data suggest that physical activity might impair immune capacity. AS

- 475 Wachnik (A). The physiological role of copper and the problems of copper nutritional deficiency. *Nahrung* 32(8); 1988; 755-765

The paper deals with recent achievement concerning the physiological role of Cu in the human organism. The problem of Cu supplementation of the human diet is discussed. An outlook is given on the contemporary theories referring to the role of Cu in nutrition. Special attention has been paid to the Cu containing enzymes and copper-dependent enzymes as well as to the problem of nutritional Cu deficiencies. This paper shows the necessity of copper for: "cleaning" of the organism from the excesses of free radicals, biogenic amines and cholesterol, the proper synthesis of hemoglobin, elastin, collagen and probably thyroid hormones, providing the energy formed in the respiratory chain and needed for biochemical syntheses and proper physical activity. AS

TOXICOLOGY

- 476 Grischott Oppici(F)Fortini (G). Use of respirometric curves for determining toxicity thresholds in effluent biological-treatment plants. *Industria Conserve* 64(1): 1989; 42-45 (It).

A 30-min toxicity test for waste waters to be biologically purified, based on decrease in the respiration rate of activated sludges due to the presence of toxic substance, was studied. The respiration rate was measured with an Oxygen Uptake Rate (OUR) instrument. The continuous measurement of specific OUR could prevent inhibition phenomena due to massive toxic wastes in biological-treatment plants. AS

- 477 Lewerenz (H-J), Plass (R), Bleyl (DWR) and Macholz (R). Short-term toxicity study of allyl isothiocyanate in rats. *Nahrung* 32(8); 1988; 723-728

Allyl isothiocyanate (AITC) was given in doses of 0, 10, 20 or 40 mg/kg (5 days/week) by oral intubation to male rats for up to 6 wks. The highest dosage level caused a decrease in body wt., thymus wt., blood glucose and serum globulin levels. Haematological examination revealed an increased percentage of neutrophils and a decreased percentage of lymphocytes after treatment for 2 wks. Increased live and adrenal wt. were found in all test groups. Renal dysfunction was indicated by increased urinary aspartate amino transferase activity, reduced urine vol. and changes in the sp. gr. of the urine. Histopathological changes were observed in the kidneys of animals at dosages of 20 and 40 mg/kg and in the livers of animals at the highest dosage level. AS

Mycotoxins

Aflatoxins

- 478 Candlish (AAG), Haynes (CA) and Stimson (WH). Detection and determination of aflatoxins using affinity chromatography. *International Journal of Food Science and Technology* 23(5); 1988; 479-485

Aflatoxins B1, B2, G1 and G2 can be easily and rapidly detected in aqueous solutions using an affinity chromatography column coupled to a monoclonal antibody specific for the toxin molecules. The two techniques are compared and discussed. This system can be used to test for aflatoxins in contaminated samples by spot testing (> 5 mg) or as a means of HPLC clean-up for quantitative analysis at subnanogram levels. The advantages of this immunological assay in relation to their immunoassays and traditional methods are discussed. SRA

- 479 Thanaboripat (D). Aflatoxin in spores of *Aspergillus flavus*. *ASEAN Food Journal* 4(2); 1988; 71-72

FOOD LAWS AND REGULATIONS

- 480 Otwell (SW). Regulatory status of aquacultured products. Food Technology 43(11); 1989; 103-105

This article discusses the regulatory aspects of cultured seafoods with particular attention directed toward product quality and safety concerns. 17 references. SRA

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